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EDITED BY

W. R. FISHER, B.A.,

DEPUTY DIRECTOR, FOREST SCHOOL, DEHRA DUN.

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THE

INDIAN FORESTER.

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VISIT TO THE BORDERS OF CHINESE TARTARY AND TO THE SOURCE OF THE GANGES RIVER.

HAVING had occasion lately to visit the upper portion of the Ganges or Bhágirathi valley, I thought that a short account of that interesting portion of the Himalayas may interest the readers of the "Indian Forester."

After completing the examination of several deodar and box-wood forests situated in the basin of the Jumna river, I crossed over to the Bhágirathi valley by the Anchu and Deara Passes, the elevations of which were found to be 11,650 and 11,790 feet respectively.

The view of the snowy range from those passes is extremely grand, the enormous mountain known by the name of Bander-panch being passed at a distance of about 12 miles only, whilst further to the south-east, the magnificent peaks of the Sirkanta, behind which the Ganges takes its rise, form a most impressive spectacle.

After crossing the second pass we came down what may be called an uncompromising descent of about 5,000 feet in five miles, and encamped at the village of Nargon.

The next day we passed through a box-wood forest situated on the Binsi nalla, which runs into the Bhágirathi, and where we found a quantity of box-wood timber being cut for export to London.

The elevation of this forest was found to be 7,200 feet, with a north-western aspect, and as usual we observed the box trees growing amongst huge metamorphic boulders, with plenty of vegetable mould between, also abundance of moisture in the way of springs.

This species seems to prefer the deepest shade, and as a rule it is always found growing under horse-chestnuts, maples and other broad-leafed trees. The trees in this forest are probably finer than those examined in the valley of the Jumna, often running up to 60 or 70 feet in height with a girth of 4½ feet, and some of the boles being 15 to 20 feet long, free of knots.

The rate of growth is apparently exceedingly slow, and some stumps examined showed as many as 55 annual rings to the inch of radius, but the average seemed to be about 30 rings per inch. The average age of full grown trees in this forest seemed to be about 200 years.

That portion of the Bhágirathi valley comprised between Barahart and Suki villages does not present any features of very striking aspect, and the general appearance very much resembles the upper portions of the Tons and Jumna rivers. It may, however, be observed that the Ganges valley is apparently much better wooded than either of the others, especially the latter, and vast forests of Chir (*Pinus longifolia*) and Ban Oak (*Quercus incana*) exist, whereas some portions of the Jumna valley are comparatively bare owing to the more dense population.

The scenery is, generally speaking, picturesque, and some fine cliffs are passed; also owing to the steep slopes of the hill sides, culturable land is extremely scarce, and in consequence the villages are few and far between.

The journey up the valley was made along a fine forest road constructed about 12 years ago, principally by officers of the Forest Department.

The main river is crossed six times by means of a corresponding number of fine wire rope bridges, varying in span from about 100 to 160 feet, all of which reflect great credit on the officer who constructed them, although some of them are now in a somewhat shaky condition.

The total length of the road is 91 miles, and the cost was three lakhs of rupees including the bridges, whereas the original estimate for the whole work is said to have been put down at the modest sum of Rs. 42,000 only.

The geological formation of this portion of the valley is principally syenite, quartz, hard mica schist and other metamorphic rocks. The vegetation of the lower portion of the valley does not differ materially from that of the Tons and Jumna, except that in addition to the ordinary hill trees and shrubs, the *Cupressus torulosa* is found growing along the banks of the main river between 6,500 and 8,000 feet elevation. It is also a remarkable fact that the Karshu and Moru Oaks (*Q. semicarpifolia* and *dilatata*), are altogether wanting in the upper portion of this valley.

After passing the village of Suki, the appearance of the valley undergoes a most remarkable change, and the fall of the river bed at this place suddenly decreases from about 250 feet in the mile to about 40 feet only. This sudden change is probably due to recent glacial action and to the undoubted presence of two fine lakes at no very distant date.

The first of those apparently commenced about a mile above the Suki village, and extended up the valley for a distance of

about 2½ miles, and the second probably extended from Harsil for a distance of about 4 miles further up.

The formation of those lakes after the disappearance of the glaciers, was probably due to some sudden convulsion of nature, which caused several enormous landslips, which dammed up the valley and thus formed the two lakes referred to.

In course of time, but probably not very long ago, the river cut its way through those obstructions, and the lakes gradually disappeared, leaving this portion of the river in its present meandering condition. About 2 miles above Suki we entered what has recently been constituted a deodar reserved forest under the Tihri-Garhwal lease. This forest extends for a distance of about 14 miles on each bank of the river, with an average breadth of about one mile, but it is to be feared that the designation is somewhat a misnomer, as nearly all kinds of rights and privileges are allowed within the greater portion of the demarcated area.

At a place called Harsil, we put up at a bungalow belonging to the late Mr. Wilson, the well-known timber contractor and shikari.

This building is somewhat of a pretentious appearance, and is built in the native hill style, with any number of holes and corners, the whole structure being surrounded by an extensive walled court-yard, containing stables and outhouses, of all sorts and sizes. The history of the late proprietor, Mr. Wilson, is somewhat interesting, as it is said that 35 or 40 years ago he arrived in the Bhágirathi valley with only Rs. 5 in his pocket and a "brown Bess" over his shoulder, and died a few months ago, leaving a fortune amounting to a considerable number of lakhs of rupees.

The foundation of this substantial fortune is said to have been laid by a free use of the "brown Bess" on the Monál pheasants, large numbers of the skins of which he exported annually to various parts of Europe.

He then took to exporting large quantities of deodar timber to the plains, having, it is stated, in those good old times paid a royalty of only Rs. 1 or 2 per tree to the Rajah of Tihri-Garhwal.

After the greater number of the finest trees situated of course close to the river had been removed, the Forest Department stepped in and leased the forests, but as usual the action seems very much to have resembled the "locking of the stable door when the horse is stolen."

Notwithstanding the leasing of the forest to Government, however Mr. Wilson continued to export timber for the Department for a number of years, and is said to have done the work in a very satisfactory manner. This year the system of selling trees standing has been introduced, and Mr. Wilson purchased 924 first class deodar trees from the Harsil block, at

an average rate of Rs. 15 each, the girth of the trees varying from 6 to 15 feet.

We visited the site of Mr. Wilson's fellings, and found the work to have been done in a careful and economical manner.

All the trees felled were converted into metre-gauge railway sleepers, the sawing having been done principally by Punjabi sawyers, and the timber was floated to the plains during the last rains. The average outturn per tree is said to have been about 65 metre-gauge sleepers, which is rather higher than that obtained in the sleeper operations of the Tons Division, School Circle, N.-W. Provinces, where the average per tree during the last two years is found to be about 62 metre-gauge sleepers.

In the neighbourhood of Mr. Wilson's bungalow we observed a wooden erection, which on closer examination we found to be the good old English stocks, and we were informed that the use of this machine was sometimes resorted to by Mr. Wilson, and was found most effective in putting obstreperous Punjabi sawyers into a proper frame of mind. After making various scientific observations in the neighbourhood of Harsil, we proceeded up the right bank of the river to Jangla.

The geological formation above Harsil consists of very soft friable mica schist, and as no rain had fallen for about three months, and a strong wind was blowing, the consequence was, that we swallowed about as much dust as one generally does during a severe dust storm in the Punjab.

All along this portion of the Bhágirathi valley considerable gaps in the forest are observable, due doubtless to the action of avalanches, the slopes being very steep, and the snow fall on the higher mountains extremely heavy.

We found the growth of deodar in different portions of those forests very variable; in the Harsil block the average age of trees 12 feet in girth appeared to be about 160 years, whereas higher up near Jangla, a tree 6 feet in girth was found to be 207 years' old.

The number of annual rings per inch of radius also varies greatly, and on one stump examined in the Harsil block, rings half an inch broad were observed, whereas in other portions of the forest as many as 25 annual rings per inch of radius were counted.

The stocking of the forest is also extremely variable, and on the moraine of an old glacier in the Harsil block as many as 510 trees, varying from 18 inches to 4 feet in girth, were counted per acre, whereas in other portions of the forest the number of trees per acre did not exceed 10 or 12 at the most. On leaving Jangla we proceeded up the left branch of the Bhágirathi river called the Nilang "nalla," with the object of inspecting the higher Deodar and Pencil Cedar forests.

Finally, we determined to visit Nilang on the borders of Chinese Tartary, the distance from Jangla being stated to be

26 "kos" only, which we afterwards found in this particular case to represent a distance of about 20 miles. Whilst on the subject of "kos," I must not forget to warn travellers to this part of the hills regarding the extreme elasticity of this unit of measurement. In fact we found a "kos" to vary in length at different times in accordance with the frame of mind of even the same individuals, and the only convenient unit it can apparently be compared with, is the somewhat vague Scotch "bittock."

The path up the Nilang valley is of the roughest description imaginable, in some places ascending and descending steps and stairs at an angle of 45 degrees, the steps consisting sometimes of boulders and ends of logs, there winding along the slippery edge of break-neck cliffs, the path as a rule in such places sloping in an outward direction.

The traffic down this valley is considerable, and consists principally in the carriage of salt which comes from some salt lakes said to be situated 12 or 15 days' march beyond Nilang. A considerable quantity of wool is also brought down from Central Asia. The salt is conveyed by means of sheep and goats, the average load carried by each animal being about 10 seers or 20 lbs., and on the return journey the traders bring up rice, wheat, &c., from the fertile valleys of Tihri-Garhwal. On the way up we met immense flocks of sheep and goats loaded with salt, each herd being guarded by three or four formidable Tibetian sheep dogs. All these dogs are armed with strong iron collars, and during the day when not on the march they are generally seen fast asleep, but during the night they are continually on the alert, and two of them are said to be more than a match for any leopard.

We also met a considerable number of Spiti and Tibetian ponies, on their way down to the plains for sale.

The manner in which these nimble animals scramble along the path I have endeavoured to describe, and cross the most shaky bridges, is most remarkable, and we were so struck with their dexterity that we purchased two of the best we could find, the prices paid not exceeding Rs. 160.

Marching in the Nilang valley is most trying on account of the piercingly cold wind, which blows steadily up the valley during the greater part of the day, and in a downward direction during the night and morning.

This phenomenon is probably connected with the action of the sun on the atmosphere immediately over the snowy mountains, which doubtless causes it to rise during the day, the converse taking place during the night.

The downward wind is particularly chilling, and I do not recollect of ever having encountered any breeze so cutting, barring the Polar wind on the east coast of Scotland.

The vegetation of the Nilang valley is very interesting, and

the following are the principal species observed by us—Deodar up to 11,000 feet; Blue Pine *(Pinus excelsa)* up to about 12,000 feet, or 1,000 feet above the deodar; Pencil Cedar *(Juniperus excelsa)* from 9,000 to about 12,000 feet; *Juniperus communis* and *J. recurva* up to the limits of vegetation at about 13,000 feet; Birch *(Betula bhojpattra)* up to 13,000 feet; a small Rhododendron (*R. anthopagon*) up to the limit of vegetation.

Besides the above we found two kinds of honeysuckle, a rose, *Berberis vulgaris*, *Viburnum continifolium*, a gooseberry, *Acer caudatum*, *Spiræa*, a willow, and a kind of broom, most of which are found up to 11,500 feet. Neither Rai nor Morinda (*A. Smithiana* and *Webbiana*) are found in this valley, and all the oaks are entirely wanting. Birds appear to be particularly scarce, the only species observed being eagles, the Himalayan Lammergyer, Chakór (or the red-legged partridge), a small kind of crow, and a few water ousels.

The second day's march having been a short one, we started off in the afternoon to visit a neighbouring glacier observed in a side valley, and the ascent to which seemed to be an easy matter when viewed from below.

After a two hours' climb, however, on arriving near the foot of the glacier, what appeared to be a sloping bank from below, turned out to be a most awkward precipice, the scaling of which, after several unsuccessful attempts, our men utterly refused to undertake.

Under the circumstances, therefore, we were obliged, like the King of the French, who, on a certain memorable occasion climbed a hill with the object of doing battle with his enemies, but was compelled simply to march down again, without having accomplished the object in view.

The following day, however, near Nilang, we were more successful, and ascended the neighbouring glacier to a height of 14,300 feet, the foot of the glacier having been found to be 12,800 feet.

The lower portion of this glacier consists of an immense moraine, the boulders and gravel only being visible on the upper surface, with ice beneath, and a stream of water running out from below, but at the highest point we reached, pure ice only was visible.

Some of the boulders transported by this glacier are enormous, and we observed several measuring at least 1,500 to 2,000 cubic yards.

The ascent was found to be no easy matter, on account of the steep slope and rarified atmosphere, also to the fact that the loose boulders are continually rolling down, the least touch being sufficient to set them in motion.

We found Nilang to be a wretched village, consisting of about 20 houses inhabited by a number of very unwashed Tartars, who

were on the point of migrating down the Bhágirathi valley for the winter.

There being little or no rain in this part of the hills, their principal occupation seems to be in connection with the salt trade from Central Asia, also the cultivation of a few miserable fields, from which by dint of irrigating them with the water flowing from the neighbouring glacier they obtain a summer crop of buck wheat and barley.

Here also we observed some fine Yaks, the altitude being too high, and vegetation too sparse, for the keeping of the ordinary hill cattle.

The scenery of the Nilang valley is on the whole striking, and many magnificent precipices, sometimes having 1,500 to 2,000 feet sheer drop were passed *en route.*

Towards Nilang, however, all tree vegetation disappears, and the hill sides have a very burnt dried up appearance of a brick dust colour. The path past Nilang leads to a place in Chinese Tartary, rejoicing in the name of "Chuprow" or "Chuprung" three days' march further on, and where there is a fort said to be armed with enormous magnets.

The effect of this murderous armament is supposed to be, that when an enemy happens to come within a measurable distance, he suddenly finds his weapons wrenched from his grasp, and is thus expected to be left defenceless, at the mercy of his foes.

Not having had either time nor inclination to penetrate further into those inhospitable Tartar wilds, we retraced our steps down the valley, and after having crossed the Barong Gati bridge, which spans the Nilang nalla near its junction with the Bhágirathi, we proceeded to Gangotri and Gá-í-mukh at the source of the Ganges.

The bridge above referred to is undoubtedly the *chef d'œuvre* of the Bhágirathi bridges, it being 282 feet long, situated at a height of about 300 feet above the river, and the work reflects great credit on Mr. O'Callaghan, Deputy Conservator of Forests, by whom it was constructed about 10 years ago.

Gangotri, besides being a very picturesque spot, is the seat of a famous shrine, which although it cannot boast of much from an architectural point of view, still it is said to be looked upon as the eye of the world by all pious Hindus.

From the river in the immediate vicinity of the temple, the famous "Ganga pani" is obtained, and on the march we met numerous strings of coolies transporting this mild beverage to the plains, where it fetches high prices from devout Hindus, notwithstanding the fact that the original water doubtless becomes considerably diluted with ordinary "Kua páni" or other unholy compounds *en route.*

From Gangotri I proceeded to Gá-í-mukh, or the place where the Ganges is supposed to take its rise.

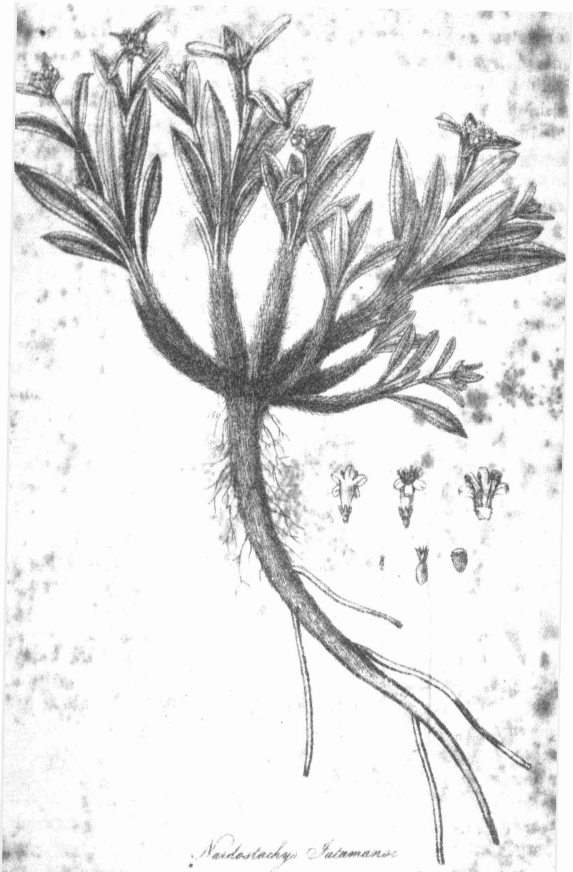
For a distance of about 8 miles along the river bank I observed numerous traps set by the local "shikaris" for a kind of rock martin, common in this part of the hills, and 100 skins of which the Rajah of Tihri-Garhwal is anxious to obtain at the rate of Rs. 3 each, with the object, it is said, of presenting them as a parting gift to a well-known local official, who is about to retire.

On arriving at Gá-í-mukh I found the river issuing from what may be called an ice cave, at the foot of an enormous glacier, probably about 5 miles long and half a mile broad, and here the mighty Ganges consists only of a small stream about 30 feet wide and 1 foot deep.

Having thoroughly explored the lower end of the glacier, and found the altitude to be about 12,800 feet, I proceeded up the hill to the right, on "shikar" intent. After having scrambled about two miles up the hill side, and ascended probably 1,500 feet, the "shikari" who accompanied me, suddenly pointed to the horns of a large animal amongst some boulders in a small ravine. It being impossible to approach nearer without being seen, and not feeling inclined to aim for quarter of an hour like the famous Mr. Briggs on the memorable occasion when he shot his first red deer, I was under the necessity of firing at where I thought the beast's body ought to be, but, as generally happens on such occasions, the result was a miss, and away went two splendid ram Barhal, down the "khud" at a break-neck pace, to the utter disgust of the expectant "shikari." After running about a mile, however, we observed the Barhal come to a halt, so we immediately set about stalking them in as cautious and scientific a manner possible, under the somewhat depressing circumstances. After about an hour's hard work we again came up with the game, when I brought down number one standing, with my right barrel at about 60 yards, and then number two running with my left, at about 150 yards' distance. On examination we found them to be a magnificent pair of old rams with 24 and 23 inch horns respectively, and after having arranged for the bringing in of the game I returned to camp 3 miles further down the valley, very well satisfied on the whole with my visit to Gá-í-mukh.

Whilst touching on the subject of "shikar," I may mention that in the Bhágirathi valley pheasants of all kinds are apparently conspicuous by their absence, and although accompanied by one or two pretty sharp scenting dogs, we saw only two covies during three weeks we spent in the valley, whilst in the Tons and Jumna valleys we should have seen the same number every two or three hours, and there can be little doubt that the late Mr. Wilson's followers have thinned out the game considerably.

DEODAR.



Nardostachys Jatamansi

Photozincographed at the Office of the Trigonometrical Branch, Survey of India, Dehra Dún December

NARDOSTACHYS JATAMANSI, THE SPIKENARD OF THE ANCIENTS.

When, some fifty years ago, Dr. Forbes Royle was Superintendent of the Botanical Gardens at Saharanpur, the hillmen of Garhwál were wont to bring down the roots of Nardostachys for sale in the bazars at the foot of the hills. On one occasion Dr. Royle obtained several pounds of the freshly dug root from Nágul, a village situated at the foot of the Himalayas about five miles N. E. of Dehra. These roots were planted partly at Saharanpur, partly at Mussoorie, and one of the former which vegetated during the cold weather is figured on Plate 54 of Dr. Royle's well-known Illustrations of the Botany of the Himalayan Mountains. Another figure on the same Plate (which we reproduce here on a smaller scale) is that of a natural plant from the hills, and is an excellent representation of the plant as it is found in its real habitat.

Nardostachys Jatamansi, DC., which belongs to the natural order of Valerianeæ, grows in the alpine Himalaya at elevations above 11,000 feet, Vedarkanta, Shalma, and Gossainthan being among the localities mentioned by Royle. On the high ridge separating the Jumna valley from that of the Ganges, it is quite common, and has been found by the writer far above the limit of forest vegetation, between 12,000 and 13,000 feet. It is also common throughout Tihri-Garhwál at suitable elevations.

In Dr. Royle's time we are told that "the roots of *Jatamansi*, no doubt the Spikenard of the Ancients, were brought down in large quantities from the Himalayas to the plains, whence they are distributed over every part of India, being highly esteemed as a perfume, and for their uses in medicine." Now-a-days this export has almost ceased, at any rate from Tihri-Garhwál. I was given to understand that the Rájah of that State had imposed a tax on the article, and that it no longer paid for the trouble of digging it up and carrying it many days' march to the bazars and entrepôts along the base of the hills. At the present day the root is chiefly brought to Najibabád in Bijnor, but even there the annual imports do not exceed twenty maunds. From Najibabád, it finds its way to Delhi, Saharanpur, and other places in the north of India. The retail price in Saharanpur and Dehra is about 10 to 12 annas per seer.

This plant is interesting as being of immense antiquity, and the eminent orientalist, Sir William Jones, has satisfactorily proved that the *Nardos* of the Greeks, the *Spikenard* of Holy Writ, the *Jatamansi* of Sanskrit, the *Sumbul* of Persian writers on Materia Medica, and the *Bálchur* of Indian bazars, are one and the same plant.

It has been objected that the fragrance of the Jatamansi is not such as to warrant the probability of its having been highly esteemed by the ancients, but Dr. Royle justly replies that "it

is both incorrect and unphilosophical to infer the tastes of another time and country from those of the age and place we live in. In the instance before us, however disagreeable it may be to some, there is no doubt that the Jatamansi is highly esteemed in the present day throughout the East, both as a perfume, and a stimulant medicine. Indeed, from the number of complaints, enumerated in Persian authors, for which it is said to be a cure, this root might lay claim to the title of a true *panpharmacon;* and with respect to the fragrance, I consider that of the true Jatamansi to be far from disagreeable."

The root, when thoroughly dry, has in my opinion a distinctly pleasant, though rather strong, scent, and I shall be glad to receive any information regarding its value with the European perfumers, and whether it is employed by them in the preparation of any of the numerous perfumes which they offer to the public. It has before now been procured in a chemist's shop in London, and no doubt it is well known to the trade, though there is probably not much export.

A. S.

THE INTERNATIONAL FORESTRY EXHIBITION.

THIS Exhibition, which will be held next year in Edinburgh, is intended to include everything connected with, or illustrative of, the forest products of the world, and will be open to exhibitors from all countries. The Committee will endeavour to obtain from the various British Railway Companies special terms for the conveyance of exhibits to and from the Exhibition. Arrangements will be made for the reception of exhibits at a date to be afterwards fixed. Exhibitors of machinery requiring the use of water, gas, or steam, must state, on making their entries, the quantity of water, gas, or steam which will be required. Medals, money prizes, and diplomas for exhibits and essays will be awarded by competent jurors. Contributors to the Loan Department are requested to communicate with the Secretary, who will supply special forms to be filled up by them. Free space will be given for workmen's approved models. To ensure uniformity of decoration and general effect, no exhibitor will be allowed to put up any sign, flag, banner, or other kind of decoration, without the approval of the Committee. Specimens will be shown of the various kinds of axes used for felling trees, as also of the different descriptions of machines for preparing the timber for constructive purposes. There will also be on view examples of textile fabrics manufactured from bark. The literature of the subject will be illustrated by reports of the Schools of Forestry in all parts of the world. Closely allied to this branch of the subject is the preparation of working plans, showing the age of plantations and the stage of growth at which cutting should be resorted to. By the preparation of

such plans the proprietors of forests are led to take a greater interest in the woods on their estates, and so are enabled the better to direct their management, preventing over-felling in some seasons, guarding against overcrowding at other times, and thus rendering the plantations less liable to the ravages of such a gale as that of October 14, 1881. The Machinery Section ought to be particularly interesting, for it will not only include the usual implements used in the felling and converting of wood generally, but also models of foresters' huts, timber-slips, bridges and weirs, sluices, as well as the machinery employed in the transporting and transplanting of timber. The Loan Collection of the Exhibition will, it is anticipated, prove one of the most attractive of all, including notable specimens of carving, wood engraving, photographs, paintings of famous trees, and also sporting trophies from all parts of the world.

The following list of Patrons, on which Her Majesty has graciously consented to allow her name to be placed, will give some idea of the interest which the enterprise is creating :—

The Marquis of Lothian, President; the Dukes of Buccleuch, Richmond and Gordon, Buckingham and Chandos, Athole, Argyll, Sutherland, Roxburghe, and Grafton ; the Marquises of Tweeddale, Huntly, and Stafford ; the Earls of Derby, Wemyss, Home, Aberdeen, Kimberley, Stair, Rosebery, Rosslyn, Seafield, Northesk, Moray, Kinnoull, Dalhousie, Galloway, Hopetoun, Mar and Kellie, Selkirk, and a large number of the principal landed proprietors throughout the country.

The Lords of the Committee of Council on Education have been pleased very warmly to commend the project, as likely to foster and encourage the spread of the knowledge of scientific forestry, and Her Majesty's Principal Secretaries of State have accorded to it their hearty recognition and support.

As usual in such undertakings, a Guarantee Fund, which at the present date amounts to nearly £4500, has been started to insure the promoters against loss.

The Executive Committee consists of—The Marquis of Lothian, K.T., President; Sir James Gibson-Craig, Bart., Vice-President ; the Lord Provost of Edinburgh; Mr. Hutchison of Carlowrie; Dr. Cleghorn of Stravithie ; Professor Archer, Industrial Museum; Mr. Murray, of the "Challenger" Expedition; Mr. Skinner, City Clerk; Mr. F. N. Menzies, Secretary of the Highland Society; Mr. Dunn, Dalkeith Gardens; Mr. Methven, Nurseryman ; Mr. Park, Engineer ; Mr. Wenley, Bank of Scotland.

Of these gentlemen, Messrs. Hutchison, Menzies, Cleghorn, and Skinner act as Honorary Secretaries ; Mr. Wenley as Honorary Treasurer ; and Mr. George Cadell, formerly in the Indian Forest Department, has been appointed Secretary.

The following resolution of the Government of India has been circulated to the Local Governments, but as it is dated 21st

December, 1883, it is feared that the notice is too short for Indian Forestry to be properly represented.

"In recommending to Local Governments and Administrations participation in the representation of India at the Exhibition in question, His Excellency the Governor General in Council trusts that, although the time available for preparation is so limited, every endeavour will be made by the provincial Conservators of Forests to expedite the preparation of a suitable collection of exhibits, which should be despatched direct to Edinburgh so as to arrive there on or before the 1st April next, the instructions on this subject contained in the papers cited in the preamble being carefully observed. No attempt need be made to get up a general collection of woods for the Exhibition, as it is proposed to send an Index Collection from Calcutta; but specially fine pieces of the most valuable species of timber in each province, which it is desirable to bring to notice, should be sent to the Exhibition. It will be useful if local Conservators would consult the Inspector General of Forests regarding the details of the collections to be sent.

"A representative set of Forest Maps will at the same time be prepared for the Exhibition by the Superintendent of Forest Surveys, accompanied by a list of the Maps.

"A report should be furnished to this Department of the action taken on these suggestions, simultaneously with the transmission of the exhibits to Edinburgh."

NOTE ON USES OF *PINUS EXCELSA*.

Pinus excelsa wood is useful for a great many purposes, and I chiefly purchase it for plane tables and patterns for the Foundry. Some parts of gymnastic apparatus are also made from it, and levelling staves. You will find in Stewart's Punjab Plants, under *Pinus excelsa*, that "Mr. Watson told him that it is the best of all for pattern-making because it works well, and is non-resinous," and Dr. Stewart thinks he must have got hold of some other common wood or picked specimens, as the *Pinus excelsa* is, he states, very resinous. Mr. Watson is right and Dr. Stewart wrong, and I can endorse what Mr. Watson states.

In former years we used great quantities of *Pinus excelsa* for soldiers' cot planks, but it was impossible to please those who had the passing of the planks, as knots and the slightest crack caused a plank to be condemned. Then the Commissariat Department got teak planks from Burma, these were split also, but as they had been bought and could not be condemned, the ends were rivetted up and the planks used.

It may interest you to know that before the days of ice machines in India, the ice ships from America used to bring out a good deal of pine wood; it was something like the *Pinus excelsa*, but free from knots, and this wood actually cost us less than the *Pinus excelsa* grown on hills that we could see from Roorkee.

A. C.

II. Review.

REPORT ON THE FORESTS OF CEYLON.

By F. D'A. Vincent, *Deputy Conservator of Forests, Madras.*

It has become quite customary for the British Colonies to indent on India when they wish for special reports and advice as to the administration of their forests, and we may instance Major Campbell Walker's work in New Zealand, Mr. Thompson's in Mauritius, Mr. Hutchins' in the Cape, Mr. Dobbs and Mr. Wild's in Cyprus, and now again Mr. Vincent's in Ceylon.

Mr. Vincent's report is very exhaustive, and though it might with advantage have been more condensed, and instead of giving the Burmah Forest Act as an Appendix, he might have drawn up some outlines of an Act specially adapted for Ceylon, yet we have found it extremely interesting, and very much to the point in its practical suggestions.

Ceylon contains 24,702 square miles, being about one-third of the North-West Provinces in area, and its population is about 2¾ millions. It is divided into seven provinces, corresponding to districts in India, each under a Government Agent, who differs from Indian District Officers in having no judicial work, and only exceptionally judicial power.

Rather less than one-sixth of the Island is under cultivation, the only permanent grain crop being paddy, and the other grain crops being grown on *cheena* or *jhúm* clearings or in gardens.

On paddy lands Government claims one-tenth of the crop, but in *cheena* crops the practice varies, in some places *cheenas* being free, in others subject to a tax of one-fourth to one-fifth of the crop when licensed, and of double this when unlicensed, and in these *cheenas* the crops are classified as dry grains, millets, hill-paddy and maize which are taxed, and tobacco, chillies, cassáva, plantains, pumpkins, &c., which are always free. It would appear, as Mr. Vincent remarks, that *cheena* cultivation is more heavily taxed than permanent paddy lands, but in the latter case the return seldom exceeds 15-fold, and the cultivation is expensive and laborious, whereas in *cheenas* the minimum of labor is involved with a return, at the lowest estimate, of 40- to 60-fold.

There is no other land-tax, but we will give Mr. Vincent's own remarks in the next few paragraphs.

"There is no other land tax, so that we have the anomaly of the principal food grains of the people being heavily taxed with a Government demand of 10 to 25 per cent., whilst all the land cultivated with tobacco, plantains, or so-called garden produce, also that covered with coffee, tea, cinchona, and likewise the large areas planted with cocoanuts, cinnamon, and citronella grass, belonging chiefly to natives, is held free of all taxes. We shall also see further on that paddy, the best food for the people, is taxed more heavily than the 'dry grains,' which are said to be very heating and unwholesome.* The only other direct tax is a poll-tax of Re. 1½ to Rs. 2 a head, paid annually by all males towards the construction of roads.

"European enterprise has employed itself almost entirely with coffee, cinchona, tea, cocoa, Liberian coffee, and in a small way with cocoanuts. Cinchona, tea, cocoa, and Liberian coffee are known as new products, in contra-distinction to coffee, which is the old staple Ceylon product.

"Coffee grows best at elevations between 2,000 feet and 5,000 feet, with a rainfall of over 80 inches. Owing to the ravages of *Hemileia vastatrix*, a fungus causing the malady known as the leaf disease, the exports of coffee have decreased from 824,509 cwts.† in 1878-79, to 564,000 cwts. in 1881-82. Ceylon coffee still fetches the highest price in the London market, but a serious fall in the market price from 100*s*. per cwt. to 70*s*., adds still further to the difficulties of the situation. Liberian coffee is largely cultivated in the low hilly country between the western coast and the mountain ranges, but the exports, which have not yet assumed any large dimensions, are included with Arabian coffee in the figures given above.

"Cinchona grows at the same elevation as coffee, and up as high as 6,000 feet. The exports are as yet comparatively small, but in a few years, when all the trees planted out in the old coffee estates have grown up, the annual production will become very large. Already Ceylon exports one-fifth of the total amount of cinchona bark imported into Great Britain. Tea and cocoa also promise to play an important part in the future trade of Ceylon.

"The exports of these three products have increased very largely in the last few years, as the following figures will show:—

Exports.

		1879.		1882.
Cinchona, ...	lbs.	1,200,000	... lbs.	3,099,000
Tea, ...	„	103,000	... „	623,000
Cocoa, ...	cwts.	122	... cwts.	1,018

"The other principal exports of Ceylon are cinnamon, cocoanut oil and coir, citronella oil, &c."

Ceylon has to import rice and paddy: over 7 million bushels were imported in 1881. Taking the Blue Book figures, showing 550,000 acres under paddy, with a yield of (say) 20 bushels an acre, the Island's production in 1881 was 11 million bushels.

† These and the following figures are taken from the Chamber of Commerce Return of October 1882.

The revenue of the island in 1881 was Rs. 1,36,86,491, being slightly in excess of the expenditure, and is derived principally from import duties on rice and cotton goods, *sales of Crown lands*, land revenue, salt and timber sales, &c.

There are excellent metalled roads kept up throughout the year, and the removal of timber is easy, and carriage cheap and abundant.

"Circumstances generally in Ceylon are very favorable for timber transport, especially in the dry zone. The streams are too small, the woods too heavy for floating; but the Island is here not more than 120 miles across, and the best forest often grows close to the sea-shore. The country is very level, the streams are dry for 9 months in the year, and a rough but serviceable cart-track can be made by cutting away the jungle. Cart hire is cheap, and the expert Malay and Tamil timber cutters have always been accustomed to heavy timber work. The forests, too, are unusually healthy nearly all the year round—no unimportant consideration."

There is a railway from Colombo to Kandy, and two branches, the total length being about 100 miles, and extensions are projected. Regarding the physical features of the country, we will again quote from the Report.

Topographical Features.

"The principal feature of the Island is a high central tableland equidistant from the eastern and western coasts. Rising suddenly from the low-lying country to the north, east, and south, and from the low hills along the western coast to a height of over 6,000 feet, it forms a very remarkable feature when approaching the Island by sea, from which Adam's Peak, over 7,000 feet elevation, is only 42 miles in a direct line. This tableland is enclosed by a range of lofty hills, rising very suddenly from the plains or low country, to an average elevation of 3,000 to 4,000 feet. Forming three sides of a square of about 50 miles, it encloses the central plateau on all sides except to the north, where, through the scattered hills of Matale, Hunnasgiriya and the Knuckles, the Mahaviliganga, draining nearly the whole of the plateau, finds an outlet. The peaks rise to an extreme height of 7,352 feet at Adam's Peak, and 6,664 feet at Namunakuli, forming the south-west and east corners of the range.

"Between the plateau and the seaboard to the west and south-west, the country is hilly and undulating. There are a few outlying spurs, off-shoots of the main ranges, rising to an height of about 2,000 feet. Except quite close to the sea, the general character of the country consists of broad deep valleys, separated by steep and rocky, though forest-covered, ridges. This hilly country coincides with the damper portions of the Island. To the south, east and north of the central mountain system, the country, from the foot of the hills down to the seashore, consists of level forest-covered plains slightly raised above sea level, the only natural features to vary the monotonous scenery being a few rocky gneiss hills.

"In the centre of the plateau dividing it into two halves we have

the highest range of the Island, with several large side spurs, running north-north-west for nearly 40 miles. The average height of this range is about 6,000 feet, the highest points—Pedro and Kirigalpotta—having respectively an elevation of 8,296 and 7,831 feet.

"To the western side of this dividing range we have what was originally all forest-covered country extending down to the edge of the low country and onwards to the sea. The country is hilly and irregular; the temperature is high and equable; the rainfall heavy and frequent, and the air always heavily charged with moisture. The vegetation is characteristic and tropical, very similar to that of the west coast of Travancore and to other tropical islands, but it is here that most of the species peculiar to Ceylon are found. Of the forest, large areas have been cleared for coffee and for cheena cultivation.

"To the eastern side of the main range we have a drier country extending for 80 miles down to the Bay of Bengal. On the plateau, for about 25 miles in the Badulla and Passara direction, there are grassy downs or patanas. The ridges are covered with grass, with patches of forest in the hollows and on cool protected slopes. The tree vegetation has less of a tropical character, and the growth shows less vigour. On the western side of the plateau the hills are very steep and the valleys deep; here the difference in elevation, between the tops of the hills and the valleys, is much less—we have long flat ridges and shallower valleys, and the country has a more undulating character. The eastern side of the plateau is protected by the main range from the summer monsoon rains, and resembling the corresponding slopes of the Nilgiris, consists of very similar grassy downs, with 'sholas' in the valleys and in protected situations only.

"The western and eastern hill slopes and the country between the hills and the western coast comprise the *Moist Zone.*

"Once off the plateau and in the so-called low country, the patanas disappear, and—occupying about three-fourths of the entire Island—we have a level country, nowhere much raised above sea level, with a moderate rainfall and a well defined period of hot dry weather, which is covered down to the seashore with a peculiar and most characteristic class of forest. The only natural features of any interest are the large isolated hills, apparently outliers of the main mountain system, consisting of enormous masses of gneiss rock. The largest of these are Friar's Hood, 2,134 feet; Gunner's Quoin, 1,766 feet; False Hood, 2,394 feet; and Westminster Abbey, well known landmarks for ships passing along the eastern coast. There is little variety except that the further north we go, leaving the main hill ranges behind, the rarer become these clusters of rocky hills, and the greater the similarity, both in physical characters and in vegetation, to the opposite Indian coast. North of Vilánkulam, for 60 miles up to Elephant Pass, there is an unbroken stretch of level forest-covered plains from sea to sea. The rainfall rarely exceeds 40 inches, and, instead of luxuriant tropical growth, we have forest of rather a stunted character. The trees, slow-growing and small, both in girth and height, often deserve the name of scrub instead of forest; they struggle on, nourished more by the humid atmosphere and the frequent rainfall than by the poor sandy soil.

"This part of the Island is elsewhere spoken of as the *Dry Zone.*

"The principal rivers and all those with a permanent flow of water take their rise from the central hill ranges. The Mahaweliganga, the largest Ceylon river, drains both sides of the central plateau, the drainage of the western slopes being carried by it past Kandy, to unite where it leaves the hill country with the Badulla or Uva branch. It runs through the important forest country of Bintenna and Tamankaduwa, into the sea near Trincomalee on the eastern coast.

"With the exception of the Kelani-ganga, which rises on the north side of Adam's Peak, all the other rivers rise on the outer slopes of the range flanking the central plateau. The most important streams are the Deduru-oya, Maha-oya, Kalu-ganga, Gindura, Nilwalá-oya, Walawé-ganga. Except for more than 20 miles from the sea, these are generally suitable for floating purposes in flood time only. Within that distance the Kelani and the Kalugangas, whose *embouchures* are at Colombo and Kalutara, and the Gindura, in the Southern Province, form fine navigable streams, on which large quantities of the lighter kinds of timber and of firewood are brought down in rafts and boats by native traders. Few of the rivers draining the drier country, even though they have their sources in the central mountains, have any permanent flow of water; of many, the beds are quite dry for nine months in the year, and the chance of floods, high enough for floating purposes, is somewhat uncertain at all times."

We will not follow Mr. Vincent in his account of the geology of the Island, but simply note that the rocks are generally sedimentary, but of uncertain age, without any fossil remains, the mountain ranges and isolated rocks being of gneiss.

It can also be conclusively asserted that the land is gradually rising, especially along the western side of the Island.

Mr. Vincent characterises the soil as mostly inferior, the superficial soil consists generally of sand, or a red sandy or gravelly loam, sometimes passing off into a red clay, and overlying deep gravel beds, in which so little nourishment is obtainable that all trees throw out large lateral roots.

In the dry zone there is no humus, but large deposits of leaf mould are found in the hills and damper zone, where there is a good rich surface soil.

Mr. Vincent considers this as very curious, as the forests are all evergreen, but the dead leaves rapidly decompose in the dry zone. Owing to this want of humus, there is no certain reproduction by seed of the slower growing and more tender species.

For an account of the meteorology, we will again quote from the report.

"The climate of Ceylon is most equable, especially along the western coast, where the daily mean temperature varies little all the year round.

"The annual mean temperature for the whole of the low country is much the same, the greatest difference being 2° to 3° between Galle and Jaffna, at the southern and northern extremities of the Island.

The rainfall and annual mean temperature of those places are respectively—Galle, 90 inches, 79·9°; Jaffna, 42 inches, 82·2°. There is, however, considerable difference in the daily and monthly mean temperature in different parts of the Island. Where the low country is affected by the south-west monsoon rains, the daily range of the thermometer is never greater than 12 degrees, the air is always saturated with moisture, and there is no real cold weather. The coolest time of the year is from May to October, as during those months the showers are frequent and the sea breeze is steady. The hottest months are February, March, and April.

"In the drier parts of the Island the daily range of the thermometer is large. being as much as 20° in some places. From October to March is the coolest time of the year, but as soon as the monsoon changes and south-westerly currents begin, the country dries up and the weather gets hot. The south-west monsoon makes itself felt in the dry zone, comprising three-fourths of the Island, as a hot land-wind, parching the grass and the leaves.

"In the Eastern Province it comes direct from the central ranges of hills, and having been there relieved of much of its moisture, gets well heated in passing over 100 miles of dry country before reaching Batticaloa or Trincomalee. In the Hambantota District and from Puttalam northwards, as indeed throughout the dry zone, although coming direct from the sea and laden with moisture, it brings no rain; all the tanks on which the people depend for drinking water dry up, and forest work becomes very difficult in many parts of the country from July up to the burst of the north-east monsoon in October.

"It is probably in great measure due to this hot wind blowing for six months in the year that the growth of the forest in the dry zone is so stunted and poor. A rainfall of over 40 inches in an atmosphere so equable and so nearly saturated with moisture is sufficient for good forest growth if a gale of wind did not blow continually for six months and dry up the soil.

"The influence of the rainfall and its distribution on the vegetation is more remarkable in Ceylon than, perhaps, anywhere else, for probably in no other part of the world are the limits of a moist zone, of heavy and light rainfall, so sharply defined by the natural tree vegetation. In parts of Bombay and Madras we may find locally some partiality in the rainfall as in Ceylon, but nowhere is the south-west monsoon so localized in its influence, and so regular in the area of its distribution, year after year.

"There is, as far as I am aware, no account published of the meteorological phenomena of Ceylon, and the science has scarcely received the same attention paid to it in other countries. Rainfall records are published by the Surveyor-General and the Public Works Department. The former has arranged 14 observing stations in different parts of the Island, where full observations have been taken for the last 10 to 12 years by paid observers. In addition to this, 50 rain gauges have been placed in different parts of the planting districts, where rainfall records are kept up. Only the rainfall returns have as yet been published, although I understand the full results of ten years' observations will soon appear in print.

"The Public Works Department return comprises 62 stations in different parts of the Island, where records are kept by overseers and tank guardians. Between this return and that mentioned above there are very great discrepancies, and as, from the position of many of the Public Works Department rain gauges, there is every reason for questioning the accuracy of the figures published, I shall only notice those published by the Surveyor-General.

"Ceylon lies directly in the path of the south-west and north-east monsoon currents, and almost all the rain clouds which empty themselves on the Island come from these directions. The only exceptions are a few thunder clouds which hang about the Island during the short period of still weather—between the close of one monsoon and the commencement of the reverse current. The south-west monsoon commences about the beginning of April, increasing in force till it reaches its height, about the middle of May. From the beginning of the month the S. W. currents daily increase in regularity and force, but usually not till the end of the month is there any steady wind from that direction on the sea coast, although in the hills the change of season makes itself felt much earlier. It is then said to burst when a succession of heavy squalls of wind and rain comes up from the sea-ward, but the average rainfall of the month of May is not much heavier than in the preceding or following months. In the hills the monsoon downpour begins much earlier than at sea level, but the burst of the monsoon is by no means so marked a phenomenon as on the west coast of India. From a series of dates for 28 years compiled in the Ceylon Directory, it appears that the small monsoon generally breaks in the latter half of April, followed four weeks later by the big monsoon.

"The rain generally clears off about the middle of August on the sea coast, but the wind lasts till the end of September, when the north-easterly currents generally commence. Towards the 15th of October their full force is felt, and a heavy downpour of rain commences and lasts generally 2½ to 3 months. The heavy rain ceases towards the end of January. On the western side of the Island the north-east monsoon wind comes from the north, and is known as the 'long-shore' wind.

"It has already been mentioned that the Central Province consists of a series of hilly ranges, which, rising from 6,000 to 8,000 feet above the sea, have a general direction from north-west to south-east at right angles to the two monsoon currents. The effect of these hills in controlling the rainfall, especially that brought by the south-west monsoon in the summer months, is very marked. Whilst the western slopes of the hills from May to September are in perpetual cloud, the eastern slopes of the central plateau are in sunshine. From the sea upwards, until we cross the highest range, there is nothing but cloud and heavy rain. Nuwara Eliya—the sanitarium, at 6,234 feet—is for months in the clouds and mist, but immediately we get on to the eastern slopes of Wilson's Bungalow, and into the eastern patana country of Uva, the rain and clouds disappear, and the country is perfectly dry. As the clouds from the westward are seen to top the ridge they descend a little, and, being quickly absorbed by the hot dry air, pass on eastwards until they are again condensed on the hills

of Bengal and Burmah. The eastern half of the central plateau gets only an occasional shower, and the leeside of the Island is likewise protected during these months.

"Immediately we get away from the influence of the hills 40 miles north of Colombo, out of the limits of what I have laid down as the moist zone, where the wind can sweep across the Island without being forced upwards by mountain ranges into a colder zone, we get no rainfall beyond an occasional shower during the whole time the south-west monsoon is blowing. It is the same in the extreme south-east corner of the Island, where the annual average rainfall of Hambantota, fully open to both monsoons, is but 37 inches, and the extremities of the Island may be said to be identically situated as regards rainfall. The south-west monsoon, affecting so small a portion of the Island, is therefore of less importance generally than the winter monsoon from the north-east.

"The only area which gets more than one-third of its rainfall or any large quantity of rain from the south-west, is that bounded on the east by the central or highest mountain range running from Kandy to Nuwara Eliya and the Horton Plains. On the north and south this area may be defined by parallel lines drawn south-west from the hills near Nálanda, and from the southern extremity of the Morawak Kóralé. Within this zone, the total annual rainfall is generally over 80 inches. On the sea coast near Colombo and Galle about half of the total annual rainfall comes in the south-west monsoon, but with increased proximity to the hills, as at Kalutara and at Ratnapura, both the rainfall and the portion of it falling in the summer months increase considerably. Ratnapura is 10 miles south-west of Adam's Peak, and this district, with Ambagamuwa and Maskeliya north-east of Adam's Peak at an elevation of 4,000 feet, are the wettest in the Island, having an annual rainfall of 120 to 200 inches. A few miles further into the hills and we get to valleys such as Dimbula and Lindula, protected to some extent on all sides, but backed by higher ranges to the east than to the west. Here the rainfall again sinks to 100 inches, of which two-thirds fall in the south-west monsoon.

"The south-west monsoon is popularly supposed to be that which brings Ceylon most of its annual rainfall; but this impression appears erroneous. On the assumption that the south-west monsoon begins in April and lasts to the end of September, the table annexed has been compiled.* From this it will be seen that the area receiving more than half of its annual rainfall from the south-westerly currents is very restricted. It also appears that the winter rains are much more general throughout the Island, whilst the number of rainy days is less in proportion to the rainfall in the south-west than in the north-east monsoon.

"In the north-east monsoon the currents are of less velocity, and although here, too, the mountains give a somewhat heavier rainfall to the eastern coast, their influence is much less than with the other monsoon, nor they do not afford much protection to the parts on their leeward side. The clouds hang about the land and are condensed generally over the whole Island.

* We regret that we have not space for this table.

"The differences in the distribution of the monsoon rains are in great measure due to the fact that in the summer the land is heated and the temperature is higher than that of the moisture-laden south-west wind. In the winter there is a fall in the general temperature of the land, due to increased radiation without a corresponding fall in the temperature of the sea, and the damp warm winds from the Bay of Bengal hang over the land, parting with a great part of their moisture. In the early winter most of the rain falls at night, which is accounted for by the rapid radiation from the soil; but as the season advances the soil gradually gets sufficiently cool to induce the atmosphere to part with some of its moisture during the day.

"It will therefore be seen—

(1). That the principal annual rainfall of Ceylon is due to the north-east monsoon, and that these winter rains are distributed over the whole of the Island, the downpour being proportionately heavier than in the south-west monsoon.

(2). That the area affected by the south-west monsoon is very limited, and is strictly confined to the country to the south-west of the dividing mountain range, no rain falling where there are no hills in the centre of the Island to force the moisture-laden clouds upwards to a colder elevation, or to lead to a condensation of watery vapour by increased pressure.

(3). That whilst on the western coast the rainfall increases with proximity to the mountains, the stations on the eastern coast have the same rainfall as those close to the hills. Again, some of the former, such as Trincomalee, have a higher rainfall than an inland station such as Anurádhapura.

(4). Again, at high elevations on the western slopes of the hill plateau the rainfall is generally less than that at lower elevations, whilst on the eastern slopes the rainfall increases with the elevation.

(5). That places like Anurádhapura, in the centre of forest-covered plains, have a much heavier rainfall than narrow strips of land close to the sea—such as Mannár, Jaffna, and Hambantota."

With reference to its meteorology, Mr. Vincent divides the Island as follows:—

The Moist Zone
- (*a*). *The Wet Zone*—comprising the western slopes of the hills and the country south-west of them; also, notably, the region of the special endemic flora. Rainfall 100 to 200 inches.
- (*b*). *The Moist Zone Proper*—comprising a narrow belt surrounding the last; also Uva, or the eastern hill slopes. Rainfall over 60 and under 100 inches.

The Dry Zone—comprising the rest of the Island. Rainfall over 33 and under 60 inches. This includes the Arid Zone and the Dry Zone Proper. The limits of the former, with a rainfall of 33 to 45

inches, are, in the absence of more extended rainfall observations, difficult to define; it comprises most of the Northern Province and the Hambantota District.

"There are several points which can only be solved when many of the now uninhabited parts of the Island are opened out and the observing stations can be more equally distributed. It will then be interesting to trace the limits of the minimum rainfall zones in the north-west and south-east corners, and the cause of the frequent drought in the latter. In conclusion, it should be noted that Ceylon is out of the region of cyclones."

Regarding the forest growth, we are told that more than 1,000 years ago Ceylon was inhabited by a large and powerful nation, the remains of which, in the form of embankments, temples, palaces, &c., are common in the forests. Mr. Vincent therefore supposes that a large proportion of the existing forests usually described as virgin, or original, are really a secondary growth which has sprung up on the disappearance of the former large population, probably between the eighth and thirteenth centuries of our era. We quote as follows:—

"Speaking generally, the forests may be said to be very patchy; on the hills only are they at all regular. Going along the village paths, (which offered the only means I had for judging of the forest distribution,) the path for half a mile passes through a fairly tall forest with satinwood, ebony and milla; then for one mile it goes through a low forest in which *Hemicyclia sepiaria* (*véré*) is the principal tree, with perhaps *only a few* of the other unsaleable woods; then we pass through cheenas of various ages, and finally reach the paddy land and the village. The same alternations occur everywhere. The villages are equally scattered over the whole Province, except on a broad strip on either side of the Trincomalee road, and also in portions of the Wilachi Kóralé. Each village has its tank, its paddy land, its cheena surrounded by forests, and each becomes a centre round which the destruction of forest gradually progresses.

"If this process has been going on for several centuries, and went on when this part of the country was thickly inhabited, the patchy nature of the forest is fully explained. *The best satinwood, ebony and halmilla forest*, such as we find on the hills, has probably not been cleared for many centuries, if ever; that where there are *satinwood mixed with véré* has been cleared more recently; whilst that *without any satinwood and only the inferior woods, véré especially*, may have been cleared in the last 200 to 300 years. Many other causes have of course been at work, and although there are many arguments against this explanation, these three distinct gradations undoubtedly exist, which cannot be traced to differences of soil and climate. As an instance confirming this suggested explanation, I may mention the forests near Yapahu in the North-Western Province.

"So great are the variations in growth, and so little do the present officers know of the distribution of the forests or of their contents, that it is most difficult to generalise from the little I was able to see here. As has been mentioned more than once, there are still large

areas unexplored. The statements of the Foresters having so often proved incorrect when I had opportunities for investigating, I must respectfully decline to put the least reliance on them. I was shown as the best forests those that appeared to me worked out, and curiously the felling contractors also subsequently made that the reason for declining to cut there. The argument in favour of there being forests and much mature timber left in the unexplored parts is but a negative one. As on the large areas still unexplored, we know that the soil and climate, &c., are the same as in those parts from which fine timber has been cut, it appears probable that the resources of the North-Central Province forests are large."

The best trees are the satinwood (*Chloroxylon Swietenia*), the ebony (*Diospyros Ebenum*), and the halmilla (*Berrya Ammonilla*), but these being slow growing are unable to make head against the more rapid growth of véré (*Hemicyclia sepiaria*) and other worthless trees.

We again quote from the report—

"At the time of the capitulation of Colombo, in 1796, it is probable that the whole of the Island must have been well covered with forest, the present large towns being insignificant hamlets. Kandy itself was only a small collection of huts round the palace of the King, whilst the more thickly inhabited parts of the Central Province and the south-western corner of the Island must have been much like the North-Central Province at the present day—the villages some miles apart, and connected only by narrow foot-paths. The Portuguese and Dutch only succeeded in maintaining coast settlements, and made no advance into the interior.

"The Kandyan Kings adopted, as the most effectual means of defence, the maintenance of a dense belt of forest, 30 to 40 miles broad, all round the Kandyan or Central hill country. This forest was carefully protected, and in the attempts of the Dutch and British to seize the Kandyan country, traversing the forest belt, and subsequently keeping up communications with the seaboard, constituted always the real difficulty. This belt of forest, which protected the Kandyans so effectually, is no longer traceable, and the area occupied by it is now remarkable for the worst devastations of the cheena cultivator.

"Under the Dutch, all private enterprise was discouraged, and it was not till 1833, after the whole of the country had been pacified by British rule, and the Kandyan power destroyed, that any great progress was made in coffee planting. Up to that time the material condition of the people had probably changed but little, although the cheena cultivator and others, benefiting by the absence of an organised Government, and easy taxation, had commenced to make inroads on the forests."

Regarding the extent of the Crown lands in the Island, we learn that no exact data are available, "as the triangulation of the Island has not yet been completed, and the existing maps are not only incomplete, but misleading.

"Fraser's map, on a scale of 4 miles = 1 inch, is most inaccurate. Provincial boundaries are 15 miles out; roads and tanks are out of

position; villages appear that have not existed during the present century; and rivers are made to run in entirely wrong directions. The map has, on the other hand, a most finished and accurate appearance, which is most deceptive, and quite different to the character of the information it supplies."

This absence of proper maps must have impeded Mr. Vincent's inspection of the forests considerably, and a good survey of Ceylon is essential before any idea of the forest area at the disposal of Government can be arrived at.

In the absence of good maps, Mr. Vincent has based his area statement of the forests on the quantity of Crown land which has been alienated, which he estimates to be about 6,840 square miles, or about quarter of the Island, the greater part of the remaining three-fourths belonging to the Crown. But in the hilly and damper portions of the Island, where the estates owned by Europeans are principally situated, it is probable that only a quarter of the area is still Crown land, whilst in the drier parts four-tenths of the country is still unalienated.

The proportion of cultivated and uncultivated land can only be roughly estimated, and is given as follows :—

	Cultivated land, square miles.	Uncultivated land, square miles.	Total, square miles.
Moist zone, ...	2,500	6,200	8,700
Dry zone, ...	1,440	14,560	16,000
Total, ...	3,940	20,760	24,700

We give Mr. Vincent's own words regarding the proportion of the uncultivated land which is forest-clad :—

"To determine what part of the uncultivated Crown lands is covered with forest is difficult. Originally, when the country was opened up by the British, it is probable that the greater part of the Island was covered with good timber forests, the following being the principal areas not so covered. In the Northern Province, and throughout the rest of the dry zone, within two to five miles of the sea, there is a good deal of open bush country—not unlike the Punjab Rakhs—with clumps of rather stunted bushes and thorny trees, separated by large open stretches of grass. On the north and west sides of the Island, as far south as Puttalam, and in the south-east corner of the Island, the country within two to five miles of the sea (or even twelve miles in the Hambantota district) is chiefly of this character; not continuous, being often broken in places by good forest going down to the sea-beach, or separated from the sea by a strip of forest one to two miles broad.

"On the eastern side of the Island is the so-called Park Country

(Nilgalla-paláta), of a park-like character, the trees standing singly or in clumps in fine open stretches of grazing land. In the North-Central Province, especially towards Minéri, Pollonáruwa, and in Tamankaduwa, there is a good deal of low land, often with sour black soil, on which only a few Palé, *Acacia leucophlœa*, *Bauhinia tomentosa*, *Cassia marginata*, &c., grow. Finally, in the hills, there are at all elevations the patanas or downs, covered with coarse grass or a few *Careya arborea*, Rhododendron, &c.

"These may be said to constitute the chief exceptions to the rule—that the whole of Ceylon was at one time covered with forest. For these, for the large areas of natural scrub forest in some parts of the Island, and also for the areas of village tanks, roads, rivers, &c., we may make a liberal allowance of four million acres, or one-fourth the area of the Island, and then half the area (8 million acres) is left, on which the absence of forest is not explained by any natural causes. In a climate so favourable that forest will grow on the worse soils, probably the whole of this area would be covered with good timber but for one cause—cheena cultivation."

The account of cheena cultivation which follows is very interesting, resembling the jhúms in the Garo hills, though there the principal staple is cotton as well as hill paddy :—

"Cheena is the Ceylon form of the Indian kumri or jhum, and the Burmese toungya, and as in those countries, it is a favourite means of earning a livelihood. It is so well known, that it scarcely needs any description. The cultivator goes into the virgin forest and fells all but the largest trees. Having allowed the wood and branches to dry for one month or so, he sets fire to the whole. When the ground is fully cooled the surface is slightly raked to work in the ashes, and afterwards sown with rági, hill paddy, or maize; a rough fence is made of the unburnt logs, and the cheena is left till the grain begins to ripen. After the first crop is reaped, gingelly, maniok, amu, or hén-kek (*Cucumus utilissima*) are usually taken off the land as a second crop, and then twelve months after the first clearing the soil is finally abandoned.

"Cheena cultivation has always in Ceylon enjoyed special advantages, as regards taxation, over paddy, the only permanent food grain cultivation, and this, combined with the enormous returns—reaching to 500-fold—which are obtained for the minimun expenditure of labour, has caused it to be a favourite method of cultivation with a thriftless indolent people. Paddy cultivation is most laborious, and requires unremitting attention and watching. The return is uncertain, especially since in late years the seasons have become so irregular. In cheenas, two slight showers are sufficient to ripen the crop. This, with light taxation, unlimited extent of land, and the possibility of securing by one month's labour, of which the wife and children can do a large share, sufficient grain for twelve months' consumption has, assisted by many other circumstances, caused this destructive form of cultivation in some parts of the country gradually to absorb all the forests. In the Blue Books between 1870 to 1881, it will be seen that the area of dry grain cultivation has doubled. The area of paddy cultivation in the same period shows no material

increase, notwithstanding the construction of irrigation works, whilst in some districts the revenue officers record a marked decrease, accompanied by an increase in dry grain cultivation. In whatever way we look at it, paddy cultivation has been at a disadvantage, especially when a native knows that, if he grows paddy, he must be subject to great extortion by the 'renters,' whereas to his solitary forest cheena the renter will not pay many visits, and then, although he has to give up one-fourth of the crop, it is better to do that, when the area can be easily extended, than risk the loss of the crop by having to wait until the renter choses to come and allow the paddy to be threshed.

"The effect of cheena cultivation is not only that an enormous amount of good material is wasted and burnt—the larger trees left standing being all killed by the fire—but the character of the vegetation is completely changed, and the more frequently the same area is cleared, the less the growth resembles the original forest.

"Cheena ruins a poor soil like that we have in Ceylon, and a thorny-stunted scrub growth comes up which only grows to a height of 20 to 30 feet. Only after seeds of the better kinds of trees are blown in from the neighbouring forest do timber trees once more grow up. Thus 40 to 50 years may elapse, and it is evident that as more forest is destroyed the less chance there will be of seeds finding their way to the cheena, whilst the more frequent the clearing the more the soil deteriorates. In this way, with nothing but cheenas for miles, it might take hundreds of years before the ground once more became clothed with forest, even if it were left undisturbed.

"The above are the results when the soil is only cultivated for twelve months, the reproductive power of the tree-stumps not being entirely destroyed; but in the Eastern Province cheenas are cultivated for three or four years. The Moormen of Batticaloa, now as in Sir H. Ward's time, supply the capital and the seed, whilst the poor Sinhalese or Veddahs get the cheena permit and cultivate, the Moors taking the greater part of the crop. Kurakkan is succeeded by maize, then come cucumbers, to be followed by maniok and, finally, plantains. The latter stand for eighteen months, and by the time the patch is abandoned the soil is so thoroughly exhausted that even the usual cheena scrub refuses to grow. Nothing comes up but Illuk grass (*Imperata arundincea*) and a few straggling stump shoots of *Pterospermum suberifolium*, which are gradually killed off by the annual fires, for in the Eastern Province every year during July and August the horizon is now darkened by the smoke of the burning grass on these old cheenas. The damage does not stop here, for each year a circle of trees round the burning patch is killed by the fire, and the area of grass extends itself, or the fire frequently rushes into the standing forest for some distance, damaging the trees and killing all the seedlings.

"The effect of this mode of cultivation in Ceylon has been less disastrous than in India and Burmah. There the population is large, the area of uplands suitable for growing dry grain crops is limited, and this, combined with certain restrictive regulations, has tended to confine the cultivation within narrow limits, forcing the people to return to the same land, and to clear it after only six to ten years'

rest. Both in India and Burmah there is also a long hot weather, drying up the soil and causing forest fires. The soil, exhausted with such frequent cropping, declines to grow anything but sparse jungle and grass, and the entire character of the country and climate is changed.

"In Ceylon the supply of land has always been large for so scanty a population; cheena crops can be grown anywhere, and fresh forest or 40 to 50 years' cheena growth has generally been available for clearing. Although the soil is so bad, the equable humid atmosphere and abundant rainfall cause a dense growth of thorny scrub to come up, which, though perfectly useless in other ways, serves at least to protect the soil.

"It is in the Sinhalese parts of the Island that the cheena cultivator has done most harm, and having had uncontrolled command over all the forest, has succeeded in clearing away most of it. The least observant traveller by rail to Kandy and Náwalapitiya cannot fail to notice the general absence of high forest, the enormous areas of scrub, whole hill sides—one unbroken sheet of dense bushy growth—the annual succession of clearings being marked by the different shades of green, from the grey of the recent clearing, to the bright green of the two or three-year old bushes, and the dark green of those ten years old. Or, ascending any of the peaks, he will see before him nothing but a vast sea of one uniform growth, consisting mainly of Lantana or *Beesha stridula** in the moist zone, with perhaps a wooded knoll here and there, which being too steep and rocky for cultivation, has been left; or, in the low dry country, he will be able to trace into the far distance the rivers and depressions, by lines of taller trees of darker hue, showing where the devastator has found Kumbuk trees, *Terminalia glabra* or Mi (*Illupi*, Tam.) *Bassia longifolia* too big for the axe, or where in the lower ground on the river banks, the scrub has grown up rather more rapidly. No more deplorable sight could be found, and the only reflection is, what might have followed similar ill-treament in a country less favoured in climate. The extent of cheena, in one unbroken stretch, is such as Burmah or India never saw.

"The Central Province has an area of uncultivated land of over three million acres. Allowing 100,000 acres for the reserved forests

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* *Beesha stridula.*—*Batali* covers thousands of acres in the Western and Southern Provinces. In the Southern Province, lantana has not spread so extensively as in the Western and Central, and this small bamboo, growing to a height on old cheenas of 6 to 10 feet, generally springs up within a year or so of the crops being reaped. It grows in dense thick masses, and like the Illuk grass in the Eastern Province, it gradually encroaches on the forest. After it has grown up to some height, the ground is covered with a dense mass of dry stems and leaves, which in dry weather take fire readily; each time the scrub is fired a fresh row of trees round the edge of the forest is killed, and the Batali replaces them. For the cheena cultivator nothing could be more convenient, as it saves him the trouble of clearing. In the Southern Province—the Hinidum Pattu especially—may be seen large areas of soil so exhausted that it will only grow ferns—*Gleichenia dichotoma.* Here, too, after two or three years' growth, sufficient dry material accumulates, to admit of the whole being fired. This the natives do as often as they can to induce tender shoots of grass to come up, and the forest is slowly but surely encroached on. The same process may be noticed in the Southern Province about Batapola, where the annual firing of the grass in the swampy low lands leaves its mark in the shape of dead trees on the edges of the surrounding forests.

at over 5,000 feet elevation, and 400,000 acres for patana land, roads, &c., the total area of good forest, out of 2½ million acres of waste land, is not more than 30,000 acres.

"In the large Kandy district with 316,000 acres of waste, there is, I am told, beyond a few rocky ridges at the lower end of Dumbara, one forest only (Tumpané). In the Badulla district, the largest in the Island, with 2,119,000 acres of uncultivated land, I was not able to hear of more than a few 100-acre patches on rocky knolls. There is an unbroken stretch of cheena from the Kumbukan-aar to the northern end of Bintenna, a distance of 60 miles. In breadth, this cheena scrub extends from the foot of the hills to the Eastern Province boundary, a distance of some 25 to 30 miles, the boundary line being distinctly marked—by cheena scrub on the Badulla side—by fine forest on the Eastern Province side. The only forests in the Central Province are in the Mátalé district, and here too the cheena cultivator is busy. Half of the district, at least, is said to be nothing but cheena and scrub, with patches of forest left on the very rocky slopes. Even when we come to examine the forests, they are found to be more or less cut up into small blocks by large intervening stretches of scrub.

"On the western side of the Island the state of things is very much the same. In the Western Province, with 1,400,000 acres of waste, we could probably not find more than 100,000 acres of good forest even including patches of 150 acres and under. In the Kégalla District, with 289,000 acres uncultivated, there are said to be no forests of over 500 acres. In the Kurunégala District, North-Western Province, with 600,000 acres uncultivated, we pass through nothing but cheena from Chilaw to Kurunégala, and thence to Diyatura, Nikaweratiya, and Polgahawela, a total distance of 90 miles, along which there is no large block of forest within 5 miles of the road on either side. It is the same in the Southern Province, or rather worse, if that were possible. Figures such as these, although they cannot pretend to great exactness, give a reliable idea of what destruction cheena cultivation has caused, and how intimately a solution of the question concerns the forests.

"In the drier parts of the Island immense damage has been done, but owing to the population being scanty, the areas cleared are on the whole much smaller. It is not, however, the difference in climate which has saved these forests, for the greater part of the Badulla District already alluded to is in the dry zone. It is in the latter, too, that the most marked increase of dry grain cultivation, accompanied by a decrease in the production of paddy, has of late years taken place. (See Annual Reports, 1880, Mullaittívu and Hambantota Districts).

"Without a record of the areas cleared for cheena, and until the vast areas of Crown land have been thoroughly explored, accuracy in estimating the area of the forests is impossible, especially when many of the so-called forests on the western side of the Island consist of small patches, generally under 100 acres, surrounded on all sides by cheena clearings. In the Western Province there are still some forests of workable size left on the Kélani-ganga, and on the Kalu-ganga, with larger ones in the inaccessible Kukulu Kóralé and Sinharája country. From some of the former revenue can always be made, but

many of the finest forests have, as is explained elsewhere, been sold along these rivers, and there is great uncertainty as to the actual extent still belonging to the Crown. In the southern parts of the Kurunégala District, and in the Galle and Mátara Districts of the Southern Province, the best forests have been sold or cleared, and the Crown is forced to get its timber from distant forests, difficult of access, or else to buy from the persons to whom it originally sold the forests.

"Any approximation as to the area, when so little is known, would therefore be valueless: and it can only be said of the moist zone generally, that the forests left are chiefly in small isolated blocks, and that their present area, if most carefully preserved from further diminution, will be barely sufficient for the ordinary requirements of the public.

"In the hill country the area of forest left is very small. There is a reserve of about 100,000 acres on the highest ranges at an elevation of over 5,000 feet. The only forests of any size at elevations under 5,000 feet are situated in the accessible country of Adam's Peak, on the south-west slopes, with an annual rainfall of 200 inches. These are to be retained as climatic reserves, and from their position would never be valuable for any but a small local supply of timber and firewood.

"In the dry zone the areas of forest are so large, whilst they are so mixed up with scrub, and such a large extent of country is still unexplored, that it would be useless to attempt any estimate of their extent. The uncultivated area is given at nine million acres, from which large deductions must be made for the coast belts, the Park Country, &c. The areas of cheena scrub too are so enormous, that without a detailed examination of the country block by block, with an accurate map, no approximation even can be made. With nothing but my own personal impressions to work on, and without official records to assist me, it would be misleading to give any figures. Probably one-third to one-half of the uncultivated area in the dry zone is covered with forest trees—not good forest, but valuable timber trees mixed with unsaleable or worthless woods in every proportion, often of course interrupted by considerable stretches of scrub.

The forest vegetation may be considered as littoral, and of the dry and moist zone. The littoral vegetation is much the same all round the islands, and consists of several species of mangroves. The cocoanut only flourishes in the moister portions of the coast, and towards the northern end of Ceylon is replaced by the palmyra palm with its 800 different uses.

The surya or tulip tree (*Thespesia populnea*) is a common avenue tree, but not indigenous, though its timber is much valued for coach building.

We give Mr. Vincent's description of the forest vegetation of the dry zone :—

General Characteristics of the Forest Vegetation in the Dry Zone.

"The forests are almost entirely evergreen, very few species being

ever leafless, whilst of those that do lose their leaves—satinwood, *Schleichera trijuga* (Kong), *Excœcaria* (Falconeria) *insignis* (Tilé)—only the last mentioned remains bare long. The distinguishing characters of the forests are great density and compactness of growth, general uniformity of size with inferiority of girth and height; a dense undergrowth of arboreous shrubs and sometimes nillu (*Stenosiphonium*), with a marked absence of herbaceous surface growth, such as grass, &c. In nearly all the forests we find the ground covered with a great variety of species crowded together, all struggling and hustling one another for light and air, without any being able to shoot up to a good height or to assume a dominant position. The average height of the trees is about 30 to 50 feet—rarely over 60 feet: all the species grow to the same height, three only—satinwood, palé and halmilla—making much show above the rest.

"When the trees have reached their maximum height they form very broad flat crowns, which interlace, and besides serving to throw an impenetrable shade on the soil, keep out the wind which blows so steadily for the greater part of the year. Above the flat umbrella-shaped tops of the other trees, satinwood and halmilla can be distinguished at a great distance by their isolated crowns. The girth of the trees is small, and after reaching a certain size never increases much. Except of satin and palé, trees of 6 feet girth are rare, and the majority of species forming the forests are never more than 3 feet in girth. Halmilla, one of the most valuable timbers, is rarely over 4 feet in girth. The absence of dominant trees is remarkable, as is also the want of predominance of one or more species in the forest, such as generally results from their superior vital power or from their longevity. Whether this and the small size of the trees are due to poverty and want of depth in the soil, is a matter for conjecture. The growth of all the species is very slow, with the exception of halmilla, which sometimes appears to be rapid.

"Instead of herbaceous undergrowth, (nillu being chiefly confined to inferior soil and open forests,) a dense undergrowth of arboreous shrubs or of seedlings of the larger trees springs up, forming a miniature forest 6 to 10 feet high, and rendering progress, except along a cleared path, almost impossible. There is a want of humus, the poor soil being covered only with a thin layer of leaves. Except during the north-east monsoon, the soil is generally dry, but at the same time well protected against the wind and the sun by the dense shade of the trees and the undergrowth. The south-west gales pass over the forest, unable to penetrate the dense growth, and the natural protecting barrier formed by the entwined crowns, and the air inside the forest is quite still.

"The most characteristic tree of these forests is *Hemicyclia sepiaria*—Véré (Wera-gaha, Sinhalese), with its curious fluted stem. It is the commonest in all forests of the dry zone, and in many there are more of this peculiar tree than of all the others put together. The stem assumes irregular shapes, rarely straight and round, with longitudinal flutings, which are often split off for axe handles; the girth seldom exceeds 2½ feet, with a low spreading crown. It appears to be often a sign of bad soil and of old cheenas, for some of the fine forests in the Eastern Province are almost free of it, whilst on ad-

joining patches, with many other unmistakeable signs of old cheena cultivation, it forms one of the principal trees.

"Another most characteristic tree, although not entirely confined to the dry zone, is *Terminalia glabra*, of little value as a timber tree, but forming a very graceful object round the numberless tanks, which are in themselves a remarkable feature in the scenery of this part of the Island. All the streams are bordered with it, and no other tree approaches it in size.

"The trees of the dry zone forests which yield the only timber saleable at present are:—

Ebony (Diospyros Ebenum).
Satinwood (Chloroxylon Swietenia).
Halmilla (Berrya Ammonilla).
Palé (Mimusops indica).
Milla (Vitex altissima).
Wavarani or Yavarani (Persea [Alseodaphne] semecarpifolia).

"The following are the commonest species mixed up with the saleable timbers:—

Venangu (Pterospermum suberifolium).
Murali or Mora (Nephelium Longana).
Moré (N. Gardneri).
Vedekanari (Diospyros ovalifolia).
Chemelpanichi (D. crumenata).
Panichi (D. Embryopteris).
Kulodi (Chickrassia tabularis).
Aili (Ulmus integrifolia).
Rukkatana (Alstonia scholaris).
Mi (Bassia longifolia).
Kaditeni (Sterculia fœtida).
Kanchura (Strychnos Nux-vomica).
Kuma (Glenieia zeylanica).
Punerai (Sapindus emarginatus).
Koketiya (Garcinia terpnophylla).
Tirkundel (Cassia Fistula).
Naval (Eugenia Jambolana).
Kolon (Adina cordifolia).
Helambé (Stephegyne parvifolia).
Kong (Schleichera trijuga).
Vela maram (Acacia leucophlæa).
Pieri (Elæodendron glaucum).
Tammana (Mischodon zeylanicus).
Kumbuk (Terminalia glabra).
Munamal (Mimusops Elengi).
Vammi (Sarcocephalus cordatus).
Lunimidella (Melia dubia).

"The following are the principal species comprising the undergrowth:—

Kaian (Memecylon edule).
Do. (M. grande).
Manchuvana (M. capitellatum).
Kannu (Anstrutheria zeylanica).
Ulavinté (Polyalthia Korinti).
Karani (Webera corymbosa).
——— (Taxotrophis Roxburghii).
Klaka (Carissa diffusa).
Nelli (Phyllanthus Emblica).
Tuvere (Maba buxifolia).
Taintuki (Dimorphocalyx glabella).
Gulserú (Premna tomentosa).
Nillú (Stenosiphonium).

"Locally, as in the Eastern Province, the following become fine timber trees, and are common:—

Katupulian (Dialium ovoideum).
Mara Illipé (Polyalthia longifolia).
Nedunari (P. coffeoides).
Vella-karungali (Diospyros oocarpa).
Tumpalé (Vatica sp.) [*Beddome*].
Tombúkata (Calophyllum elatum).
Churapunné (C. Burmanni).
Do. (C. tomentosum).
Wild mango (Mangifera zeylanica).
Punné (Calophyllum Inophyllum).
Marungé (Eugenia zeylanica).

"For the majority of these woods there is not the least demand; occasionally in the Eastern Province a few wild mango, kumbuk or tombúkata are cut to make canoes, churapunné for the spars of *dhoneys*, or in the North-Western Province, tammana for building; but the small demand for all woods, other than those mentioned above, is best shown by the fact that for the last six years, the average annual number of trees cut on permit in the Batticaloa District has been only 65.

"The great variety of species has already been alluded to, but the small proportion of the valuable timber to the valueless is still more remarkable. The general condition of the forests is, that trees of one or more of the saleable kinds are mixed up with a very large variety of the valueless woods. The former never exist as a pure forest by themselves, and collectively, even in the most favorable situations, never form more than one-tenth of the whole. It is only in the fine forests of Bintenna, in the Eastern Province, and on some parts of the western coast, that satinwood, ebony and halmilla compose this share of the standing growth. In nine-tenths of the forests of the dry zone the saleable woods do not form more than 2 per cent. of the whole. Looked at from a professional stand point, the forests are most disappointing. They exhibit very poor growth, and the great mixture of species suggests at once great difficulties of management, and comparatively high working expenses. For our timber supply, the annual operations must cover a very large area, which will necessarily involve great cost in road-making, &c., and in supervision.

"Throughout the same great difficulty of treatment presents itself. The valuable trees are far apart and are much in the minority. They are slow growing, and especially in the case of one of the most important—satinwood—do not bear shade well. In cutting out an ebony or a satin tree we rarely find any young seedlings or saplings of the serviceable woods near. Forming a compact forest all round, are trees and saplings of all the unsaleable, valueless kinds, with a dense underwood of the same or allied species, ready to fill up the gap, and to choke any seedlings of the better kinds which may spring up.

"Before the felling, the seedlings of the better kinds of trees rarely take root in the dense shade, where they stand a poor chance in the struggle with the dense arboreous underwood. The latter, with its dark-green leathery leaves, scarcely suffers at all from the shade; it waits patiently for its opportunity, and immediately an opening is made, shoots upwards and soon outgrows the satin or the ebony seedlings.

"The bad reproduction of both ebony and satinwood, especially the latter, is very striking. In none of the forests, where fellings have lately been carried out, is a fair proportion of young trees to be seen, and I can only remember one forest in the North-Central and North-Western Provinces with any number of young satinwood trees.

"Of halmilla the reproduction is far better, but still it suffers considerably from the shade of the worthless trees, and has failed to reproduce itself completely over most of the large areas, which it formerly covered in the Eastern Province.

"With palé, reproduction is as unsatisfactory, and in the Northern Province, where this tree is quite at home, we notice everywhere the absence of young trees and of seedlings, other faster-growing ones having got the upper hand."

In the arid zone we read that palé is the principal tree, forming about $\frac{1}{15}$th of the standing crop, satinwood and halmilla are rare, and of ebony, owing to the destruction of the traders, comparatively little is left.

Mr. Vincent divides the moist zone into three sub-zones as follows :—

"The following are the divisions :—

ZONE 1.—*The Low Country*,...	Elevation, from sea level up to 2,500 feet. Rainfall, 60 to 100 inches.
ZONE 2.—*The Lower Hills*, ...	Elevation, 2,500 to 5,000 feet. Rainfall, over 100 inches.
ZONE 3.—*The Upper Hills*, ...	Elevation, over 5,000 feet. Rainfall, 80 to 100 inches.

"In addition to these may be added a zone, including the regions of the heaviest rainfall—100 to 200 inches—with a special endemic flora ;—elevation up to 7,000 feet.

ZONE 1.—*The Low Country.*

"This possesses a very rich vegetation of a purely equatorial character. Of trees, the following selection is fairly characteristic :—

Dillenia indica (Hondapara).
* ——— retusa (Godapara).
Garcinia spicata (Kokati).
——— echinocarpa (Madol).
* Calophyllum Inophyllum (Teldomba).
* Mesua ferrea (Ná).
* Doona zeylanica (Doon).
* Vateria acuminata (Hal).
* Vatica Roxburghiana (Mendora).
* Dipterocarpus zeylanicus (Hora).
Bombax malabaricum (Imbul).
Eriodendron anfractuosum (Pulun-imbul).
Canarium zeylanicum (Kekuna).
——— brunneum (Mahabullúmoragaha).
* Filicium decipiens (Pehimbia).
* Melia dubia (Lunimidella).
Walsura Piscidia (Kirikong).
* Schleichera trijuga (Kong).
* Mangifera zeylanica (Etamba).
Dalbergia frondosa.
Pterocarpus Marsupium (Malugaha).
* Pericopsis Mooniana (Nedun).
* Cassia siamea (Aramana or Wá).
Adenanthera bicolor (Masmorú).
Pygeum zeylanicum.
* Carallia integerrima (Dawata).
Terminalia glabra(Arjuna),(Kumbuk).
——— belerica (Bulú).
——— chebula (Aralú).
Eugenia Gardneri.
Eugenia aquea (Waljambú).
——— micrantha, &c.
Barringtonia racemosa (Mudilla).
Lagerstrœmia Flos-Reginæ (Murutu).
* Homalium zeylanicum (Liang).
Canthium didymum (Porua-mara).
Morinda bracteata (Ahú).
Chrysophyllum Roxburghii (Lawalu).
Bassia neriifolia (Gan-mi).
* Alstonia scholaris (Rukuttana).
Holarrhena mitis (Kiriwalla).
Oroxylon indica (Totilla).
Vitex Negundo (Notchi).
* ——— altissima (Milla).
Cinnamomum zeylanicum (Kurundu).
Myristica Iria (Iria).
——— laurifolia (Malaboddu).
Litsæa tomentosa, &c., &c., (Dawalkurundu).
Gyrinops Walla (Walla).
* Artocarpus nobilis (Del).
* ——— integrifolia (Kos) Jak [not native].
——— Lakoocha (Etaheraliya).
Ficus laccifera (Nuga).
——— infectoria (Kiripella).
——— indica (Tjiela, Miq), &c., (Ella Nuga).
Mallotus (several).
Macaranga tomentosa (Bukenda).
Croton lacciferum &c., (Keppitia).
Briedelia retusa (Ketakela).
Cycas circinalis (Madu).

"There are in the undergrowth several species of Calamus and two species of Bambusa (*B. vulgaris* and *B. spinosa*). The Kittul (*Caryota urens*) is common in most forests of the low hilly country.

* These are the principal timber trees. The native names given are Sinhalese.

The talipot palm (*Corypha umbraculifera*) is characteristic of the western slopes of the hills at 1,000 to 2,500 feet altitude, and is specially noticeable on the Kandy railway incline.

The smaller shrubs and undergrowth comprise such species as numerous Anonaceæ, Allophylus Cobbe, Erythrospermum phytolaccoides, Hydnocarpus venenata (Makulú), Osbeckia aspera, Memecylon (several), Ixora coccinea (Ratmal), Wrightia zeylanica (Walidda), Premna tomentosa (Buseru), Blachia umbellata, Phyllanthus (several), and an abundant bamboo, Ochlandra (Beesha) stridula (Batali). Other interesting species are—Nepenthes distillatoria (Bandarawel), Exacum zeylanicum (Kinihiriya), Knoxia zeylanica, Elettaria Cardamomum (Ensal), Sanseviera zeylanica (Niyada), Gloriosa superba (Niyagala), Flagellaria Susum, Raphidophora (two species), Pothos scandens (Potha), &c. Many plants in these lists are peculiar to Ceylon, or at least do not occur in the Indian Peninsula.

Zone 2.—*The Lower Hills.*

"In this zone, which may be reckoned to extend roughly from 2,500 to 5,000 feet, the great clearings for coffee estates have mainly been made, and the native vegetation has proportionately suffered. It was formerly the orchid district of Ceylon, but several species once found are now probably lost, whilst many others have become very scarce.

"The following trees may be given as characterizing the lower hills, though many are by no means confined to them:—

* Calophyllum tomentosum (Kina).
* Doona Gardneri (Doon).
* Vateria Gardneri.
Cullenia excelsa (Katubodu).
Aglaia apiocarpa
Mastixia arborea (Diatalia).
Pithecolobium subcoriaceum.
* Carallia calycina (Ubberia).
Terminalia parviflora (Hampalanda).
Eugenia Jambolana (Mádan).
*——— operculata (Batadomba).
——— Neesiana, &c
Careya arborea (Kahata).
Isonandra Wightiana.
* Mimusops Elengi (Munamal).
Diospyros sylvatica.
——— Toposia.
Olea glandulifera.
Fagræa obovata.
——— Gardneri.
Chloranthus brachystachys.
Machilus macrantha.
Helicia zeylanica.
Ficus Wightiana (Kalaha)
——— dasyphylla, &c. (Kirinuga).
Celtis cinnamomea.
Scleropyron Wallichiana.
Ostodes zeylanicus (Wal Kekuna).

"The undergrowth is largely composed of nillu (Strobilanthes, of which some seven or eight species are found at these elevations) and species of Amomum and Zinziber; there are also many Balsams (Impatiens), Gesneraceæ, parasitic Christisonias, &c. The magnificent climbing epiphyte, Kendrickia Walkeri, formerly common, is also an ornament of the few remaining patches of forest in this region.

Zone 3.—*The Upper Hills.*

At about 5,000 feet the mountain flora proper begins; our altitudes, however, are nowhere sufficient for the growth of anything like an Alpine vegetation. The trees are, with few exceptions, low, and are often marked by their small thick coriaceous evergreen leaves. The following may be mentioned as characteristic species:—

Michelia nilagirica (Sapu).
Calophyllum Walkeri.
Gordonia (3 species).
Elæocarpus obovatus, &c. (Galweralu).
Ilex (2 species).
Meliosma pungens.
Semecarpus coriacea.
Pygeum Wightianum.
Photinia Notoniana.
Sarcococca pruniformis.
Eugenia calophylla.
Eugenia rotundifolia.
——— sclerophylla.
——— mabæoides, &c.
Rhododendrom arboreum (Maharatmal).
Symplocos obtusa.
—— læta, &c.
Olea Gardneri.
Cinnamomum ovalifolium.
Actinodaphne (4 species).
Litsæa (5 species).

"A very handsome tree-fern, Alsophila crinita, and six species of small bamboos are also noticeable.

"In these mountains, however, it is rather the herbaceous and shrubby plants that attract attention, many being members of European genera. The others are generally members of genera found in the mountains of Southern India. In most cases the species are distinct and usually endemic. As examples may be noted—of the first-class, Ranunculus (2), Viola (2), Berberis, Geranium, Rubus (2 or 3), Alchemilla, Agrimonia, Heracleum, Galium, Dipsacus, Campanula (2), Gentiana, Calamintha, Plantago, Juncus (2), &c.; and of the second, Impatiens (about 12), Osbeckia (3 or 4), Sonerila (6), Hedyotis (12), Anaphalis (7), Lobelia, Exacum (2), Strobilanthes (9 or 10), &c.

"Grasses and sedges are numerous, as well as orchids, both terrestrial and epiphytic, and ferns.

"There are no native species of Cupuliferæ or Coniferæ in Ceylon.

"The present state of the greater part of the hill country, as modified by coffee planting and cheena clearing, does not afford many opportunities of examining the forest vegetation. Up to 5,000 feet, nearly all the forests have been cleared for coffee estates, and owing to this and the destruction caused by cheenas, there are probably not 5,000 acres of original forest left between 2,000 feet and 5,000 feet. The indigenous species have been supplanted to a great extent by foreign secondary growths, the principal being the lantana; said to have been originally introduced by General Lowe in 1833 from the West Indies, this plant has spread over the whole of the moist zone, including the hill country up to 3,500 feet.* From sea level upwards, all the abandoned coffee estates and cheenas are covered with a dense tangled growth of lantana, never over 6 to 8 feet high, to the entire exclusion generally of other species. In the drier parts of the Island the spread of this pest has been less rapid, but one can watch its annual progress along the roads leading towards the eastern and northern coasts. After seeing the enormous lantana-covered areas and the dense matted growth covering the soil, it looks almost hopeless to think of tree-forest once more covering the land without artificial aid. Of other introduced species, the commonest are *Mimosa pudica*, *Mirabilis jalapa*, *Passiflora fœtida*, *Ageratum conyzoides*, the latter being the worst weed on coffee estates. Most of these and the

* Lantana has also overspread Australia and Tasmania. In the Nilgiris it goes up to an elevation of 5,000 to 6,000 feet, but in Ceylon 3,500 feet is the extreme limit.

many other introduced species, which have now spread so extensively, originally escaped from the Royal Botanical Gardens at Pérádeniya and Hakgala.

"The principal timber trees are included in the above lists. Of these, calamander* and nedun are the only cabinet woods; jak and milla are durable for building—the former being the principal furniture wood of the Island; of both the supply is limited, and the prices asked in Colombo are very high—such as Rs. 2 per cubic foot for jak† scantlings—owing to the only other good building woods—such as satin, palé, &c.,—having to be brought from the distant dry zone forests. The other woods, hora especially, are used for indoor work, for native houses, for coffee and plumbago casks. In the hill country the only woods used are doon for shingles and rafters, liangu, sapu, keena, domba.

"The forests here have been little affected, except in the case of cabinet woods, by the depredations of the traders. In the forests of the dry zone the valuable trees are scattered, and a man to make money has to spread his operations over a large area. Here, the timber dealer preferred buying the best of forest land, with standing timber worth Rs. 300 to Rs. 400, at an upset price of Rs. 10 an acre, with Rs. 2½ survey fees, to taking out a permit for a certain number of trees and paying a royalty on each stem. The disastrous effect of this policy not only in actual monetary loss, or in the neglect of this valuable and permanent source of revenue by Government, but in its depreciatory effect on the rest of the forest lands, and in the openings given for theft when protection was entrusted to local headmen, and when the law afforded assistance neither in checking forest destruction nor in controlling the transit of timber, may be better imagined than described.

"The cabinet woods, such as calamander and nedun—the former especially—have been almost exterminated from these forests by permit holders, and in a great measure by theft. At one time both were comparatively common, yet now in the restricted area in which calamander grows well—the Ratnapura District, the Pasdun Kóralé and the Hinidum Pattu—so few trees are left, that the position of each can be given by the older local inhabitants.

"Little durability though the softer wood possess, there is considerable demand for them in Colombo, and along the coast between Negombo and Mátara, and large fortunes have been made by purchasing blocks of forest land, and utilising the timber for cask-making and other purposes, for which the hard woods are too expensive or too hard to work. There is an entire absence in Ceylon of light durable timbers, such as teak, and consequently, hora, mango, and other inferior woods find more favour than they merit.

"The teak tree may now be considered naturalized in this part of the Island. Originally introduced by Van Rhede, towards the end of the seventeenth century, numerous plantations were made under the Dutch Government, and being specially protected by most wise provisions, it spread over the greater part of the coast districts.

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* Known in the timber trade as Coromandel wood.

† Jak timber comes now almost entirely from private land.

Under British rule the tree no longer enjoys special protection; most of the original plantations have been sold or the timber cut, yet it still continues to spread, notwithstanding its numerous enemies. Of teak timber there can be no talk, when even in Government plantations the trees are lopped, and on private land the smallest poles are cut. But the growth is good even on the poorest soils, in situations not too much exposed to the wind, and the further cultivation of the tree merits early attention. The imports of teak into the Colony are considerable; it is employed for the flooring and beams of all larger buildings, for which there is no suitable Ceylon timber."

In his chapter on the sale and export of forest produce, Mr. Vincent states that the local consumption of timber is very small, and that that from Government forests has to compete with wood from private lands and with Burmah teak; for inferior timber and firewood every one helps himself from the cheenas, and that the collection of minor produce, such as orchilla weed, the bark of *Acacia leucophlœa*, tan stuffs, palé fruit, gum, &c., has hitherto been either free, or the royalty realized has been unimportant. Under these circumstances Ceylon forest management must look to foreign export and endeavour to meet the demands of the timber trade.

Regarding the markets we quote as follows:—

"The following are the principal timbers exported from Crown lands:—

"*Ebony.—China Market.*—This wood is exported to China principally. In China, ebony is used for making chop-sticks and small pipes, the latter being the most important. The wood is shipped from Ceylon to Shanghai, and thence most is taken to Ningpo, where the chop-sticks, &c., are manufactured. For this market logs of about 5 cwts. are preferred, but a deep jet-black colour is the great object. For pipes only the best black wood is taken, fair-sized straight logs being preferred, but for chop-sticks inferior wood is generally used. For the best black wood any price will be paid, and Ceylon has the monopoly of the market. The following estimate of the shipping and other charges on ebony sent to China has been kindly given me by Messrs. Whittall & Co.:—

	Rs.	cts.
Receiving, weighing, marking, and shipping, per ton,	5	0
Freight to Shanghai (say) per ton, ...	30	0
Marine Insurance, &c., on (say) Rs. 130, ...	1	30
Import duty, landing charges, &c., in China, ...	12	50
Seller's commission, 5 per cent. (say), ...	7	0
Total, ...	Rs. 55	80

"To estimate the capacity of the China market, the average annual export for the five years, 1872-76, may be taken. This was about 500 tons, and as during that period prices were high, 400 to 500 tons can probably be yearly absorbed.

"*Europe Market.*—In Europe, ebony has of late years been largely replaced by ebonised wood—American birch being chiefly used—and

there is now comparatively little demand. It would appear, however, that there are still considerable dealings when the market is not glutted, and a good quality of wood is brought forward. The European market, including the United States, although not so steady as the China one, is still considered able to absorb about 250 tons a year. Ceylon wood continues to fetch higher prices than that from Bombay or Mauritius. At the present moment the price may be taken at £9 to £10 a ton, whilst for Bombay and Mauritius wood the prices are £8 to £10* and £6 to £8 respectively. In the London market only logs of 8 to 10 cwts., straight grained and free from knots, fetch the highest prices.

"*Bombay Market.*—In Bombay, the only Indian port to which I have been able to trace ebony exports, the prices are quoted at—

Logs from 5 in. to 10 in. diameter 4 ft. to 9 ft. length	1 rupee per maund of 28 lbs.
Logs over 10 in. diameter, 1 rupee 4 annas	do.

"These prices are equivalent to Rs. 80 and Rs. 100 per ton, and Bombay might be tried for disposing of limited quantities of the small timber, which spoils the China and London markets.

"*Kalamander or Coromandel wood* is scarcely worth noticing, as none has reached the London market for years, and there is no prospect of future exports.

"*Satinwood.*—Small quantities are taken to Europe, but the consumption there is very small, and the value of the wood for furniture is not known as much as it merits. The market is at present glutted with an over supply, and the brokers, who were selling wood twelve to fifteen months ago at £20 a ton, cannot now get £6.† In Ceylon, satinwood is used for building, furniture &c. Old satin trees are frequently hollow-hearted to a height of 8 to 10 feet from the ground, and these hollow logs fetch high prices as kottús or well-pipes—*i.e.*, as a casing for surface wells. In the Batticaloa District and in other parts of the Island no other wells are used. The greater part of the satinwood cut is exported to Madras, where it is used for furniture and general building purposes.

"*Halmilla or Trincomalee wood.*—This wood is exported to Madras in log. It is used for boat-building—the Masula boats being built of it, and by the Madras coach-builders; some goes to the Trincomalee and Bombay Dockyards and to the Madras Gun Carriage Factory.

"*Palé or Ironwood.*‡—Nearly all the timber cut is taken to the Indian ports, whence it is carried for some distance inland. It is used for door posts, window frames, roofing, &c.

"*Yavarani or Rana* is used in India for ordinary building work, and also for boat-building, as it resists the attacks of the teredo.

"*Milla—Lunumidella—Poon-wood.*—Small quantities of milla are taken to India, and a good deal of lunumidella (*Melia dubia*). The

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* Bombay ebony comes from *Diospyros Melanoxylon*; Mauritius ebony from *Diospyros tessellaria.*

† It is difficult to reconcile the Customs figures with this statement when they show that only 270 logs have been sent to Europe in the last three years.

‡ *Mimusops indica.* There are no exports of *Mesua ferrea*, the ironwood of the moist zone.

latter is used for the out-rigger floats of Ceylon canoes, and for catamarams in Madras. The wood is very light and fairly durable.

"From the eastern coast where land has been sold for cultivation, a good deal of wood is shipped to India; it consists chiefly of small churapunné posts (*Calophyllum Burmanni*). Of *Calophyllum tomentosum* and *C. elatum* (Poon wood) there are said to have been exports not long ago, spars being taken as far as Calcutta and Bombay, but since the number of sailing vessels has diminished, there has been no demand. When spars are now required by ships at Colomba or Galle, liangu or doon is supplied, or Norway pine.

Forest Produce other than Timber.

"The exports of other forest produce are unimportant. That of firewood from Crown land was stopped in 1864. Small quantities of tanning bark (entirely mangrove, I believe, coming from different parts of the coast) are exported to India, but the only other exports of importance are orchilla weed and punai nuts. The latter are the fruit of *Calophyllum Inophyllum*, or of others of the same genus, shipped to India for the sake of their oil, which is said to form 80 per cent. of their weight. Orchilla weed is a lichen (*Roccella Montagnei*), common on the trees in the stunted coast forests of the dry zone, and is used for making litmus paper, and for dyeing.

"The dried fruit of the palé (*Mimusops indica*) is exported to India from the Northern Province. When the fruit ripens in the summer, almost the entire population (men, women, and children) of the islands in Palk's Straits (Delft, The Two Brothers, &c.) migrate to the palé forests of the Northern Province. Here they live for a couple of months on the small sweet yellow fruit, and also dry large quantities for sale in Jaffna and the Indian ports. To collect the fruit the branches are lopped off, immense harm being done to the trees. The forests that suffer most are those within five miles of Palavarayankádu, where every tree is more or less rotten from the continuous lopping it undergoes. Wherever the palé grows it is lopped for the fruit, and although this wasteful means of collecting may be difficult to stop entirely, it should certainly be regulated in the more valuable coast forests. Small quantities of velam bark—the bark of velamaram (*Acacia leucophlœa*)—are also exported from the Northern Province to the Indian arrack distilleries.

"*An increased outturn only benefits the dealers.*—If all but the cabinet woods were consumed in the country, and if by putting more wood on the market or by reducing prices, consumption would be stimulated, one great difficulty of forest management in Ceylon would be removed. It will be seen in the next chapter, that the outturn of the forests has only been increased to benefit a limited number of dealers.

"*Effect of over-production—Ebony.*—Taking the case of ebony, in the returns it will be seen that the average annual exports of the triennial period—1876-78—were 15,000 cwts.; in the next period—1879-81—they rose to 35,000 cwts., the exports of one year (1881) being 52,000 cwts. The result of this was not to bring more revenue to the Colony, or to stimulate consumption by lowering the price of the manufactured article. The following extract from a letter of

Messrs. Jardine, Matheson & Co. will show the effect it has had on the ebony trade in China :—

"'While the imports of ebony were limited, a regular and satisfactory business was practicable, but during recent years imports have exceeded the consumption, and we have in consequence seen dull and depressed markets, accompanied by unremunerative rates. Imports during the past five years to this port are :—

	1877.	1878.	1879.	1880.	1881.
Piculs,	... 10,300 ...	16,900 ...	17,684 ...	18,450 ...	—
Value of best black-wood—Taels,...	4·00 ...	3·75 ...	3·40 ...	3·00 ...	2 80 (per picul of 133⅓ lbs.)
	(Rs. 12·00)...	(Rs. 11·25)...	(Rs. 10·20)...	(Rs. 9·00)...	(Rs. 8·40)

To-day's (September 15) quotation is taels 2·60 (Rs. 7·80).'

"The effect of this policy in Ceylon is alluded to elsewhere, and although few sales have taken place in the last twelve months, ebony is still unsaleable, except to middlemen willing to buy at about the same price as satinwood, on the chance of a re-sale to shippers.

"*Excessive supplies of Satinwood and other timbers.*—Over-supplies of other export woods have had the same effect on the Indian trade. In the Madras Presidency, where there is in many parts great scarcity of timber, the demand for timber is no doubt very large, but here, as in Colombo, the dealers stand between the producer and the consumer. A reduction in price only means larger profits to the dealer, for the latter, when he buys cheaply, is able to hold out for even higher prices than if he had, with borrowed capital, to realize quickly. Unless, therefore, by some means we can stimulate the demand, by giving the consumer the benefit of a reduction in prime cost, it is useless increasing the production.

"*The foreign markets to be carefully watched.*—The markets abroad require to be very carefully watched, and the supplies regulated entirely in accordance with the demand. The men who ship timber to India are all more or less connected by caste and by business relations, and to resist their combinations the only way is to find out from India what demand exists. If they are not satisfied with a fair trade profit on the price paid here, means must be taken to secure a larger circle of buyers by shipments to the Indian ports.

"*Cost of timber in Madras out of proportion to the price paid in Ceylon.*—No steps have as yet been taken to regulate prices in Ceylon by those current in Madras; consequently, I find that halmilla is being sold to the Madras Railway Company at Rs. 3-8 per cubic foot, and satinwood at Rs.-2-8, which must have cost landed in Madras about Re. 1-4. This is but one solitary instance, but there is every reason for supposing that prices, out of all proportion to those we receive, are charged all along the coast.

"*Correspondence with foreign Markets.—Supplies to be limited.*—In the ebony trade a combination of this sort is not likely to re-occur, if the policy of selling to native middlemen is finally abandoned. But here, too, the Forest officer must adopt precisely the same means for securing reliable intelligence from foreign markets as the people with whom he is dealing, and no longer work blindfold with sharp men of business. There is no reason why we should try and part with all our timber as rapidly as possible; and unless fair prices are paid, it is

better to hold back supplies. With ebony, of which the supply is so short, this should certainly be our policy. It is far better to sell 1,000 tons at Rs. 100 a ton than 2,000 tons at Rs. 50, if the difference in price is only pocketed by the dealer.

"*Palmyra Rafters and Reepers.*—It is to the large trade in palmyra timber grown on private land to which I would chiefly direct attention. The palmyra palm (*Borassus flabelliformis*) grows only in the dry zone—the island of Mannár and the Jaffna peninsula being its principal home. It here attains a height of 60 feet, with a girth of 2½ to 3 feet in the female, and 2½ feet in the male trees. It attains its full size at 70 or 80 years according to soil and climate. The trees are grown 6 to 10 feet apart, the latter distance being considered best for rapid growth. Where the palmyra grows the Tamil is said to come, and the numberless uses for each part of the tree explain why he sows it. There are said to be 801 uses for the tree, its leaves, sap, &c. Every part is fully utilized, and in the Jaffna peninsula it furnishes employment to a large number of people who draw the sap for toddy or for jaggery, and live for several months in the year on punatto and on kelingoes. Punatto is the dried pulp surrounding the ripe palmyra nut; kelingoes are the freshly germinated palmyra seedlings, which are boiled and ground into flour; the latter is mixed with jaggery and made into cakes.

"*The Timber.*—The most valuable product of the tree is its timber, for which there is an unlimited demand in India. The heart of the tree is soft, but there is a broad shell of outside wood, consisting in the female tree of an almost solid mass of thick vascular bundles: in the male tree the vascular bundles are separated by more or less cellular tissue, and the wood is lighter and less valuable, whilst the outturn is less. The female trees are taller, straighter, of greater and more equal girth throughout. About 16 male trees are said to be equal to 13 female, the value of a female tree being Rs. 2½ against Rs. 1 for a male."

In the 21 years 1859-1880 an average of over 27,000 palmyra trees have been annually felled, the export of palmyra rafters in 1881 being valued at Rs. 65,000. Mr. Vincent remarks—

"To determine whether the supply of palmyra timber is falling off is a matter of considerable importance. The palmyra at present only grows in any quantity in Jaffna and Mannár; in the former the population is rapidly increasing, and cultivation is spreading over a very limited area. Under these circumstances, when a good price is offered for palmyra timber, it is to be feared that fresh sowings do not keep pace with the fellings. Certain small areas are planted every year with palmyras near Jaffna and the larger villages where the toddy rents make the trees valuable, but no systematic attempts are made to keep up the supply of timber. No rule exists, as in Tinnevelly, that for every tree felled another must be planted, and there is too much reason to fear that the large decrease in the exports is due partly to a failure in the supply. The Tamils throughout the Jaffna peninsula derive no small portion of their food from the palmyra products, whilst a large number may be said to live on the

tree entirely. In the spring they make jaggery; during the rest of the year they live on the money so earned, and on punatto and kelingoes. Apart from the timber supply, the maintenance of palmyra groves is, therefore, of considerable importance."

We will not follow the report through the lengthy account of the Ceylon timber trade, it is sufficient to say that the permit holders were practically without any efficient supervision, and helped themselves to enormous quantities of timber in excess of the amount paid for to Government. Mr. Vincent summarizes as follows :—

"In every way the old license system was bad and ruinous. There were no means of preventing illicit felling, or of protecting the standing timber from injury and damage; no thought of replanting or of assisting the natural process of reproduction, whilst, in the simple matter of revenue, Government did not receive its proper share of royalty. The latter was rated first at 10 per cent, afterwards at 25 per cent.; yet when ebony was selling at £8 to £12 a ton, trees averaging 5 cwts. at least were sold at 96 cts. to Rs. 2 a tree.

"The evils of this system attracted the attention of the Hon. John Douglas, the present Colonial Secretary, then Auditor-General, soon after his arrival in the Island, and he issued a circular calling for reports as to the levying and collection of timber revenue, and the general management of the forests. The replies, unanimous in a condemnation of the existing arrangements, were reviewed by Mr. Douglas in a letter addressed to the Colonial Secretary in June 1871, and it is from this letter that we may date all the recent improvements in forest administration.

"Mr. Douglas's principal suggestions were that Foresters should be appointed to the Eastern and Northern Provinces (those being, as we have seen, the principal timber-producing districts), and that their duties should consist in the selection of trees for felling, the right to cut and utilize the timber marked in a certain area being sold by auction to the highest bidder. The proposals also comprised details of what the Foresters' work would be, and other matters which have not as yet received the attention they fully merit. The establishment of nurseries to be kept up by guardians in charge of irrigation tanks, and the replanting of cheenas with teak, jak and other trees on planting leases were mentioned.

"The result of these suggestions was that Foresters were appointed by Sir W. Gregory in 1873 and 1874 for the Eastern, Northern, and Southern Provinces. The Forester's post in the Southern Province was abolished in 1874, owing, I believe, to the timber trade being almost entirely in the hands of private persons, who bought large areas of forest at nominal cost in 1830–40. Similar appointments were made in the North-Central and North-Western Provinces in 1877. In the Central Province, the Superintendents of minor roads were from 1875 appointed supervisors of forests in addition to their usual duties, on salaries of about Rs. 500 a year. A Forester has lately been employed to check cheena cultivation in the Kandy and Mátalé Districts. The persons selected for appointment as Foresters were, in the case of the Eastern and North-Central Provinces,

officers of the Public Works Department; in the other Provinces they had not previously served under Government.

"The rules for Foresters, given in Appendix B., were issued in October, 1874, in substitution of those first issued in 1873. They still remain in force. In addition to these rules the Foresters had for their guidance certain suggestions drawn up by the late Dr. Thwaites, Director of the Botanical Gardens, Pérádeniya, which related chiefly to measures for replanting, for assisting the national reproduction by clearing away scrub and creepers, and for the introduction of more valuable kinds of timber.

"The Foresters were placed in subordination to the Government Agents in all their work, maintaining, however, a somewhat distinct organization in office work and in matters of general routine, instead of forming part of the provincial revenue administration. In 1873 it was not considered advisable for Government to take the responsibility of working out timber from the forests, owing to the unfavourable results of a so-called experiment made in the Badulla District, of entrusting a Public Works Officer with the felling of timber. It is as well, though, here to notice, that the felling and conversion of the Monaragalla timber failed from defective superintendence, and owing to the position of the forests—14 miles from a cart track across hilly country. It was quite a misnomer calling it an experiment, when no one would care to buy timber without some means of carrying it away being provided. The timber consequently remained to rot in Mupané, where I saw it in July last. In the Western Province a small quantity of timber was also cut by Mr. Elliott for the Kalutara bridge from the Pasdun Kóralé, which did not prove a financial success. Small experiments of this sort are worse than useless, and it should be remembered that timber operations require, if they are to be brought to a profitable conclusion, most careful organization and more of personal superintendence and individual exertion than perhaps any work ever attempted by Government.

"Under the revised rules of 1874 the Forester's were to undertake timber works themselves on what is known as the *direct system of working*, the arrangement being that the contractors should fell and bring to depôt the trees selected by the Forester, the timber being afterwards sold by public auction, payment being made for felling and transport at a rate—per log or per cubic foot—previously agreed on. The second paragraph of the Forester's rules directs that the trees to be felled should be marked by the Forester. This I find has been neglected except in the Eastern province. Contractors have been allowed to select the trees for felling, to cut them very high above the ground, and to waste timber in cutting up and squaring. The Forester has not always visited, or ascertained the position within some miles of the place where felling was going on. I have reported separately on the subject, as it is one of the most important duties of the Forester to choose the trees for felling, and himself to see that the whole of the timber is utilized to the best advantage; not to trust to contractors and cartmen, who will always consult their own interests.

"All timber works appear to have been conducted on the direct system until 1879, when what are know as the '*share of timber*' and

the '*share of proceeds*' systems were invented. Of these, a short explanation will be necessary, nothing of the kind having, so far as I am aware, ever been attempted before.

"The *share of timber* working consists in the contractor bearing the cost of bringing a certain number of logs to depôt, receiving in payment a share—generally one-half, sometimes two-thirds—of the timber delivered. Under the *share of proceeds*, the contractor similarly bears all the expense of felling and carting in return for a share, previously agreed on, of the money received at the Forester's sales. The timber is delivered in depôt, and auction sales are held there.

"A desire that all revenue officers have of wishing to swell their receipts at all costs, to make the maximum of revenue with the minimum of expenditure, can have only originated the system, coupled as it was with a mad competition in forest revenue between the different Provinces, carried on without the least thought for the welfare of the forests, or of the real interests of Government. The budget allotments were unequally divided amongst the different Provinces, and in the absence of some control it was possibly natural for the Government Agent and the Forester to invent some system by which, say, the North-Western Province would appear in nett forest revenue not behind other Provinces which were more fortunate in securing large timber votes, and which were, therefore, able to bring out more timber by direct money payments. When the annual votes for timber works did not suffice to keep all applicants for contracts fully employed, these methods of making revenue without any expenditure were at once made use of. Contractors desirous of making large profits were only too willing to work on terms so unfair to Government, so remunerative to themselves, which, moreover, offered some of the many chances of sharp dealing so dear to natives.

"The many disadvantages inseparable from any such arrangement are self-evident, but the want of proper system and central control involved many others, work having been conducted in the following way—

"Having prospected with the help of veddahs or of village Sinhalese and found a forest conveniently situated, the contractor made his offer to work out a certain number of logs for a share of the timber or of the sale-proceeds. The contract being signed and the necessary permit issued, the timber cutters and cartmen were sent to the forest. The cutters were allowed to select the trees for felling, to cut as many as they liked, and to log and square them at discretion; the carters then removed the timber, little attempt being made to control the work from first to last.

"The contractor himself did not always visit the forest. Even when he provided the bullocks and carts, he sublet the felling and logging contract to timber cutters, who again employed the Sinhalese to find suitable trees at a fixed sum per tree, these people also agreeing to clear a cart track leading to each. Under this system every one consulted his own convenience. The cutter took such trees as were most convenient, the cartmen and cutters alike preferred short light logs to long ones, and generally one is inclined to question the advantages over the license system of work on these lines, when the openings for great waste and theft are so patent.

"After the contractor had carted all the timber to depôt and obtained his share, it competed in the market with the Government timber. Having borrowed his working capital he was obliged to sell soon. Large quantities thus thrown on the market only forced down prices, and the Government share sold usually at much lower rates than if the whole had been sold by Government.

"No measures were taken to check the number of trees felled or their outturn, to check the carts going along the roads, or to see if the arrivals in depôt corresponded with the fellings. Receiving a share of timber, the contractor had only to mix up this share with stolen timber to defy detection."

Regarding the disadvantages of the share system we read as follows :—

"The financial disadvantages practically amount to this : to bring one ton of ebony to market—work which we can get done for Rs. 15 in cash—one ton of ebony was given to the contractor having an intrinsic value of, at forced sales, Rs. 52 ; at open market prices, Rs. 90 to Rs. 110. Surely Government credit is not so low that it cannot get sufficient money to work out a few tons of ebony at Rs. 15 a ton, instead of giving three to six times as much by paying in kind ! The price of other timber might sink so low, that it would be to the disadvantage of Government making a cash payment for wood difficult of transport, of low value, and uncertain demand. But with ebony, having such a high intrinsic value, this could never be the case. The demand is steady, the supply is limited, and the Ceylon Government has the practical monopoly of the China market. Anything so entirely opposed to commercial principles can hardly be imagined, and the large actual loss shown by no means represent the losses which Government must suffer for some time from an overstocked market.

"The financial disadvantages, however great, do not by any means equal the administrative evils which I have already mentioned, nor do they represent the waste of timber which always took place. In Pallakelle forest, 25 miles north of Kurunégala, I found that a Tamil, dismissed from the Public Works Department, and working here on share contract, had felled and left many fine pieces of ebony, some of which had been cleaned by the fellers, others being untouched. This was seen in a short walk through the forest, not in making a detailed inspection. In the same forest there are some of the finest halmilla in the Island—trees 5 to 6 feet girth, running up 50 or 60 feet to the first branch. The contractor had been felling a large number, removing only the butt end logs and leaving more good timber than he removed, owing to a fall in the market price of timber causing the contract to be less profitable than when commenced.

"Experience in India has taught that auction sales of good timber rarely succeed, and Ceylon experience points in the same direction. The native purchasers always combine to keep down prices, and a reserve price is fixed which the buyers seldom bid up to. The time of the Forester is consequently wasted in going through the form of an auction, in leaving proper forest work and going to and from the sale depôt, when it is a foregone conclusion that none of the timber will be sold.

"The monthly sales at Trincomalee were held under the supposition that Colombo firms would send representatives to bid for ebony, &c.; this they failed to do owing to the great expense and difficulty of getting there, and partly owing to a reserve being fixed, often out of all keeping with the prices current in London and China. The trade was therefore left entirely in the hands of local chetties, who combined to keep down prices, knowing perfectly well that ultimately the price must be reduced. Combination gained the day, and finding that the local authorities were ignorant of the current prices in Colom o, &c., the finest timber was ultimately secured here and elsewhere at very low rates.

"Wood sold by auction is bought up by natives and re-sold at a heavy profit. The fall in price at the Government sales is not met by an equivalent in the Colombo market prices. Satinwood sells retail for the same price now as it did two years ago. With ebony, we find a difference of 100 to 200 per cent. in the price paid to Government and that which shippers in Colombo have to pay. The timber trade is at present in the hands of a few middlemen, who combine to keep down prices at Government auctions, and to keep them up in Colombo The finest ebony on the Mutwal beach was bought at a Government sale for Rs. 25 a ton; adding Rs. 15, the actual cost of carriage to Colombo, it was laid down for Rs. 40 a ton: the owner will not sell under Rs. 90. In the same way at Polgahawela, Rs. 30 only were bid for a class of wood selling for Rs. 70 to Rs. 90 in Colombo.

"The following extract from a letter received from Messrs. Churchill and Sim, the leading timber brokers in the London Market, will show how far the market has become overstocked:—'The market here for satinwood has been completely glutted with wood for the past six months, and we now hold a large stock for which we cannot obtain £6 per ton (of 50 cubic feet), whereas twelve to fifteen months ago we were selling at £20.' £6 a ton is equivalent to about Rs. 30 in Ceylon, or about 60 cents a cubic foot, freight and other charges coming to £3 a ton or more. Satinwood is, therefore, 25 per cent. cheaper in the London Docks than in the Ceylon Government sale depôts.

"Even in arranging the sale measurement of timber some supervision would have benefited Government interests. Ebony is always sold by the ton weight, and in the trade is invariably weighed when sold. At Trincomalee, the Forester of the North-Central Province told me he was allowing 40 cubic feet measurement to the ton. As Ceylon ebony weighs about 75 lbs. to the cubic foot, or 30 cubic feet to the ton, I recommended a reduction of the allowance by 25 per cent., and that the actual weight be always ascertained. In the Mátalé District, the ebony was neither measured nor weighed, but a 'liberal estimate' was made of the weight. Had there been any control, or the least comparison of results and working, this extreme liberality with Government property, presenting the purchasers with 20 to 25 per cent. more than they paid for, would have been obviated.

"Going through a forest worked by the traders, one is struck by the number of rotten ebony trees. Almost every stem over 4 feet in girth has a large gaping wound, where the feller 'tapped' for the

black heartwood. The quantities of heart and sapwood vary very much, so if after tapping he found the proportion of the former insufficient, he went on to the next tree, the result being that through the hole rot set in. This destructive practice has only been discontinued in one Province."

Whilst the Forester's time has been occupied in vain attempts to control the export of timber, works of reproduction and improvement have been neglected. Although rules were issued for clearings of inferior wood, and introduction of better species, it is said that no systematic work has been done, for want of funds.

A few cheenas have, however, been sown with teak, in the same way as in the Burma toungya plantations, and some small teak plantations made under Dutch rule still remain. Of these old Dutch plantations, of which there was formerly a considerable area, some have been cleared and absorbed in surrounding properties, others have been sold, and generally the trees now standing are only seedlings or stool shoots from the trees originally planted. One of these plantations is leased annually for Rs. 2-8 per annum, the branches being lopped and burned to manure the ground. The trees still standing are of all sizes up to 5 feet in girth, and one of the plantations has been claimed by the Sinhalese by right of 50 years' occupation.

There are other more recent teak plantations, but the soil is generally unsuitable and the plants inferior, the best results having been obtained in the Puttalam plantation in the North-Western Province, regarding which Mr. Vincent states :—

"In the North-Western Province, two miles inland from Puttalam, the Forester planted, in 1880 and 1881, 8 acres with teak, chiefly 6 feet apart. An additional 4 acres has now been cleared. The soil is a light sandy loam. The clearing is surrounded by forest, and as long as that stands, is well protected from the wind. The rainfall is 45 inches. The cost of clearing the original forest has been Rs. 30 an acre: this has been met by savings made by the Forester during four years from his transport allowance. The nursery work and planting out have been done at odd times by the Forester's depôt and baggage coolies, with some assistance from prisoners in the Puttalam jail and poll-tax defaulters. The trees have grown very well, those of 1880 being 23 feet high, but straggling and ill-shaped, having been planted 12 feet apart. The five months' seedlings put out in November 1881, 6 feet apart, are now 12 feet high; all are very healthy and completely cover the ground. As the work may be said to have been carried out without extra expense to Government, Mr. Maggiolini having at a sacrifice of his personal comfort kept down his travelling expenses, it appears most creditable that he should have succeeded in making the first really successful teak plantation in Ceylon, in a position where its unlimited extension is possible, although scarcely advisable. The soil and climate are not suited for growing fine timber, and when the trees reach the height of the surrounding forest the upward growth will probably stop."

The results of the teak cheenas is given as follows :—

"*Pulukanáwa.*—The best teak cheenas in the Eastern Province are near Pulukanáwa tank. In the earlier attempts, in 1876, the teak seed was sown when the cheena was cleared with the Indian corn crop, and no maniok or plantains were allowed. In 1877 and 1878 some land was sown as the plantain crop was dying down. The soil is bad—gravelly and sandy loam of no great depth, and having been thoroughly exhausted by the crops, is now covered with illuk grass and venangu stool shoots. The trees are unequal, and they have generally a rather stunted appearance. Those sown in 1876 are 20 to 25 feet high, 1 foot 3 inches to 1 foot 7 inches in girth; the younger trees are 20 feet high, and of 12 inches girth."

Regarding the reserved Government forests, we read as follows :—

"*Reserved Forest Lands proclaimed under the Timber Ordinance.*—Under Ordinance No. 12 of 1840, and under the present Timber Ordinance, various forests have at different times been proclaimed in the *Government Gazette* as *Reserved forest lands*, in which either no timber may be cut for any purpose whatsoever, or in which no valuable wood may be cut for agricultural implements. These forests are situated in the Western, North-Western, Southern, and Central Provinces.

"*Other Reserves.*—There are also so-called reserves, which are not proclaimed as reserved forest lands under the Ordinance, but are held by the Government Agent as reserved owing to some circumstance, such as their being village grazing lands, &c., rendering their sale inadvisable.

"Although the two classes of reserved forest would appear to be quite distinct, there is little real difference between them. When reserved forest lands are proclaimed under the Ordinance, the Kóralé or Pattu, the name of the forest, its situation and area are usually specified as sent in by the native headman."

The value of these reserves may be calculated when it is stated that they have not been demarcated, and in only one or two instances was Mr. Vincent able to ascertain their situation.

Mr. Vincent gives some interesting information regarding the land sales, which we give as follows :—

"I would briefly draw attention to the ill-considered plan on which land sales have hitherto been conducted, and their prejudical effect on the timber supply and on the Crown forest revenue. It has been shown elsewhere that the area of Crown land sold between 1833 and 1880 amounted to 1,177,086 acres, the total sum realized being £1,871,689, or an average of over 31*s.* an acre. The system has been to sell to the highest bidder any land applied for, the sale being free of all claims and conditions as to cultivation. No thought was given to climatic reserves until 1873, when, owing to Sir Joseph Hooker's representations, some areas in the Central Province at high elevations were saved. The reservation of forests for fuel or timber has likewise been treated with the same neglect. The principle has been that all considerations must give way, as Sir William Gregory states,*

* Sessional Paper No. XIX. of 1873.

in order to swell the revenue; to allow land in the most accessible places to be sold at the upset price of £1 per acre, when a small portion of the timber repays the cost of the land. We find, in consequence, that the forests in the most favorable position in the Western and Southern Provinces have been bought at the upset price of 5*s.* 3*d.* to £1 an acre, when at the time of purchase the timber alone must have been worth many times the price paid. Within the last few years strips of forest along the navigable streams in the Western Province have been bought solely for the standing timber, the result being that the native timber traders command the market, their forests along the river banks possessing greater facilities of transport than we have in the Crown forests standing further back.

"Under the system by which land is now sold, from first to last the opinion of the Forester is not called for; it is considered unnecessary to ascertain, by means of a reliable official what effect the sale of the particular block will have on the surrounding land. Whether the land is covered with fine timber forest or low scrub appears to be of no concern, as also whether an isolated block or a part of a large and valuable forest. I believe no measures are taken in the survey to give any but a plan of the block; its relative position to other blocks, to roads, rivers, villages or forests is not shown, nor is the plan accompanied by any report as to the vegetation, soil, standing timber &c., which the surveyor might easily draw up, so that Government has, in reality, no data as a guide in according or refusing sanction to the sale.

"To show the facility with which land can be bought even in direct opposition to the authorities, I need only offer two instances. In the Eastern Province, since forest land has been no longer given for cheenas, the Mohammedan cultivators have attempted to buy it, ostensibly for paddy cultivation, at the upset price of Rs. 10 an acre. In one case, application was made for a 25-acre block near Pulukanáwa tank. A Surveyor was sent out, and in addition cut out a 50-acre block in the centre of a large area of virgin forest. Captain Walker, the Forester, happening to meet the Surveyor on the spot, and seeing what damage might be caused, was able to get a fair reserve price of Rs. 50 an acre put on the larger block, the natural result being that it was not sold. Similarly, a great deal of forest near Devilané was sold for the upset price, payable in instalments. The three years' rotation of cheena crops have been taken off the soil, and it is now covered with illuk grass only, from which fires year after year spread into the surrounding forests.

"In the Colombo District, where so little forest remains, it was only by chance that the sale of 700 acres of the best forest near Hanwella could be stopped. Availing himself probably of the temporary absence from the Island of the Hon. F. Saunders, an individual who had previously bought large areas of forest land for the timber only, applied for and got this large block surveyed. Had I not chanced to hear it in time to represent matters to the Colonial Secretary, the land would probably have been sold at the upset price, when at the lowest estimate the timber now standing may be valued at Rs. 150 an acre. The opening up of the country is no doubt desirable, but Government cannot be aware at what cost all other considerations are

waived, and for how slight a temporary augmentation of revenue the property of the Crown is being so rapidly diminished."

After giving an analysis of the cost of the forest management in Ceylon, Mr. Vincent sums up his conclusions regarding past work as follows :—

"In the Provinces where timber works have been carried out, the cost of establishments forms 28 per cent. of the gross expenditure. In the Southern and Central Provinces it forms 65 per cent. For the whole of the Island, excluding the Western Province, the forest establishments have cost 52 per cent. of the total outlay.

"To sum up the foregoing remarks, it will be seen that forest management has in the past only been a partial success.

"The want of a well-organized system of forest administration has made itself felt as regards—

The Area of the Forests and their Condition—

"By great destruction through cheena cultivation, owing to the absence of a proper law for protecting Crown lands;

"By great diminution of area, in the sale of the best forest lands in the most accessible positions at nominal prices, also causing a permanent depreciation in the value of other forest property;

"A neglect of all climatic and economic considerations, which point to the formation of proper reserves in the hills and in the low country;

"A continuance of the evils of the license system, allowing contractors to cut what and as they liked, and no change in the destructive habit of tapping ebony trees;

"An absence of all organized measures of forest improvement, such as thinning, planting, &c.;

(*Financial Success and Economic Working*).

"High working expenses, and absence of any arrangement between the Foresters as regards labour rates, &c.;

"The share system, by which the capital required for conducting forest works had to be borrowed by a native at 16 to 20 per cent., instead of being provided by Government from its cash balances, involving extravagant remuneration in kind for work done, great waste of good material in the forest, and in addition affording great openings for theft;

"A total disregard of the laws of supply and demand, each Province endeavouring to bring the maximum quantity of wood to market;

"Large forced sales without any reserve price; competition between Provinces in having auctions on the same day, &c., &c.;

"Over-measurement in making sales;

"A neglect to develope the forest resources by bringing new products to market;

"An absence of any effectual measures for controlling timber transit, &c."

(*To be continued*).

III. Timber Market.

CALCUTTA TIMBER MARKET FOR OCTOBER AND NOVEMBER, 1883.

PRICES CURRENT.

Rangoon Teak.

Mast Pieces, good large, ...	Rs. 5 to 12 per running foot,		Quotations nominal.
" " small, ...			
Sawn Timbers, ...	" 85 to 120	per ton, ...	Nominal.
Planks, long lengths, ...	" 120 to 130	" ...	"
Sheathing Boards, ½ inch, " " ¾ "	" 140	" ...	"
Boards, 1 "	" 105 to 140	" ...	"

Moulmein Teak.

Square Timbers, 20 to 30 feet long, 10 to 24 inches square, first class,	Rs. 105 to 145	per ton of 50 cubic feet.	
Square Timbers, 20 to 45 feet long, 14 to 18 inches square, ...	" 130 to 200	" "	"
Second-class Timber, ...	" 90 to 100	" "	"
Planks, long lengths, first class, ...	" 120 to 150	" "	"
Furniture Planks, 18 inches and upwards, and 1 inch thick—good, ...	" 130 to 170	" "	"
Sheathing Boards, ½ inch, double, ...	" 145 to 160	" "	"
" " ¾ inch, ...	" 145 to 170	" "	"
Scantlings (of sizes), ...	" 75 to 150	"	
Moulmein Cedar, square timber, ...	" 65 to 70	"	
Pymah, (*Lagerstræmia flos-reginæ*), ...	" 60 to 65	"	

American and Colonial Timber.

Mast Pieces, large, ...	Rs. 6 per running foot. Nominal.
Spars, large, ...	" 1-12 per " " "
Mahogany, ...	As. 6 per supl. foot of 1 inch thick.
Ash Oars, ...	" 5½ to 6 per foot.
Sál, small, " large, ...	Rs. 70 to 110 per ton.
Johore Teak Squares, ...	" 60 to 65 "

Messrs. Mackenzie Lyall & Co.

IV. NOTES, QUERIES AND EXTRACTS.

A WONDERFUL SIGHT IN THE FORESTS.

(*By* CHAJJU SINGH, F.A.S., *Meerut*).

THE following extract from a religious newspaper "The Regenerator of Aryovarta," shows that passing the Calcutta Entrance Examination does not in any way stifle the brilliant imaginations of the Meerut scholars beneath the common places of western knowledge.

The writer, a young Brahmin, who speaks and writes English with great fluency, found the forest life too hard and too hazardous, after a few weeks in the Dún, and abandoned the career of a Forester, in spite of the wondrous scenes which enlivened his short stay with us. We wish him every success in the paths of literature which he has selected :—

"In my experience as Forest Apprentice at Dehra Dún, whose daily duty it is to range forests, one day I went to inspect the Nagsidh Forest (with a few hill men), situated about 4 miles from Dehra, and separated from the Ramgarh Forest by the Suswa naddi, named after Suswa* vegetation growing on its banks, and which is very pleasing to the sight, and deemed a blessing by the inhabitants. *Nag*† means abode, and *Sidh*, holy men or Rishis. Hence Nagsidh means the abode of holy men or Rishies. In this forest there are many grottos or caves cut out of rocks, some of which are so dreary and obscure that they strike terror into the heart of the observer. I was told that the wild beasts find protection in them from the jungle fires which frequently break out. One grotto, which was cut in a rock about 60 feet high, particularly drew my attention. It had the appearance of a temple, and I desired to go up to it. It was almost inaccessible, and could not be easily approached without assistance. The hill men assisted me in climbing it. I entered the grotto and found it as convenient and comfortable as the house of a wealthy man. It had three inner apartments, in each of which a man could sleep. Judging from the style of its interior, I concluded that some engineering skill had been made use of.

"It has a natural defence against the intrusion of wild beasts owing to its rugged and steep ascent. Having descended this hillock, we then proceeded on our way till we came to a large opening about 80 feet deep. We walked a few paces along its edge, to see if there

* The common water-cress (*Nasturtium officinale*).—[ED.]
† *Nag* really means *snake*.—[ED.]

were any means of crossing it, but finding none, we were obliged to slide down its bank. The hillmen were well acquainted with the dells and glades of the forest, and consequently I had to abide by their directions. They said: 'let us enter this alcove, and, if possible, find a passage through.' While proceeding, our guide apprised me that he had seen a wonderful sight. He bade the other men stop, and told me to direct my eyes in the direction he pointed out with his finger. Upon doing so I saw a man sitting in a corner, stark naked with his back towards us. The guide and I moved noiselessly along and motioned the other men to remain behind. Upon nearing the object of our desire, unfortunately for us a stag, which was lying in the long grass, all of a sudden sprang up, and made off in the direction we were going. The strange man was startled at this sudden intrusion upon his solitude. The hair of his head reached down to his feet, and his eyes were burning like fire. His appearance frightened us much, and we had not the courage to proceed; however, he took to his heels, and we, gaining courage, followed him and beckoned him to stop, but he paid no attention to our calling. At last he entered a cave and disappeared. We stood a while in utter astonishment at the entrance of the cave, but neither of us ventured to enter; it had such a dark and dreary aspect. I mistook him for a wild man (jungli) as he ran away when we made our appearance, but the men assured me that he was a *Rishi*, or holy man, as the Forest was called Nagsidh. I then thought myself very fortunate to have seen a Rishi, and therefore abused myself for having disturbed him. We returned at 4 P.M., when on our way home we saw another strange sight, which pleased me very much; a wild bear was driving a female buffalo into the jungle with a club in its forepaws, as if it was a man, and occasionally sucked her from behind by taking hold of her hind legs. I took pity on the poor creature, and told the men to relieve her from that fate. Upon this they shrieked and clapped their hands, and pelted the bear with stones. By these means they succeeded in repelling the bear and relieving the female buffalo."

TIGERS IN THE SUNDERBUNS.—The following notification from the *Calcutta Gazette*, shows that the tigers in the Sunderbuns are no longer to remain masters of the situation.

A Planter once destroyed fifteen tigers with strichnine in a few months in Kamrúp, and in places where legitimate shikar is impossible, nothing can be more efficacious than rubbing a few grains of strichnine into the hinder quarters of the *kills*.

"*The 16th November*, 1883.—It is hereby notified that the Rangers and Foresters in charge of the following revenue stations in the Sunderbuns Forest Division, viz.:—

(1) Lower Bhola,	(5) Sheepsah,
(2) Upper Bhola,	(6) Koyrah,
(3) Pussur,	(7) Cobaduk,
(4) Bhuddur,	(8) Isreepore (Ishamuttee),

are authorized to pay, for the period of one year, with effect from 1st November, 1883, an extra reward of Rs. 25 for each full-grown tiger, and of Rs. 10 for each tiger cub that can be proved to their satisfaction to have been shot or destroyed in any other way in the Sunderbuns reserved forests, in addition to the authorized rewards payable by district officers.

"The skin and skull of each tiger and cub will be forwarded by the Ranger or Forester who disburses the extra reward to the district officer, with a report giving the name and residence, &c., of the person to whom the ordinary authorized reward is payable, and the locality in which the tiger or cub was destroyed, a copy of each such report being simultaneously despatched to the Divisional Forest Officer for information."

THE following extract is from the Annual Report of Chota Nagpur:—"At a conference held during the Ranchi Fair, rules were drafted by the Commissioner, the Deputy Commissioners of Lohardugga and Hazaribagh, the Assistant Commissioner of Palamow, and the Conservator of Forests, for the management of such forests as might be made over to the department for conservancy by the zemindars, and the Commissioner hopes that these rules may in time, after they have been explained to the landholders, be of some effect in checking the reckless destruction of forests which has been going on so long in Chota Nagpur. The demarcation of the Porahat forests, and of the Saitha block in Singbhoom, has been completed, and steps have been taken in the Mahta and Koilapal estates in Manbhoom to inaugurate forest conservancy."

WE learn from the *Watchman* that Mr. Hutchins, now on leave from the Forest Department of India, has arrived in Kingwilliamstown, which he will make his head-quarters as Conservator of Crown Forests between the Sunday's and Kei Rivers. Mr. Hutchins states, we hear, that the forests of India were in quite as bad a condition as were those of this country when they first came under the systematised and intelligent control of an organised and technically trained departmental staff. This inspires us with the hope that Mr. Hutchins' arrival may mark a new era as regards Forest Conservation in this country.—*The Cape Journal.*

V. Extracts from Official Gazettes.

1.—Gazette of India—

No. 3036S.—*Mount Abu, the 8th December, 1883.—Mr. A. E. Lowrie*, Assistant Conservator of Forests, 3rd grade, attached to Ajmere and Merwara, has passed an examination in Urdu and Hindi by the higher standard as laid down for the North-Western Provinces in the Appendix V. of the Forest Department Code and adopted for Ajmere.

No. 963.—*The 28th December, 1883.—Mr. J. L. Pigot*, who has been appointed by Her Majesty's Secretary of State to the Forest Department of India, is appointed an Assistant Conservator of Forests of the 3rd grade.

Mr. Pigot is posted to the Punjab, and his appointment will have effect from the 14th December, 1883.

2.—Calcutta Gazette—

The 18th December, 1883.—Consequent on the promotion of *Mr. A. L. Home*, to be a Conservator of Forests, 3rd grade, with effect from the 24th April, 1883, and the departure, on furlough, on the 23rd May, 1883, of *Mr. R. H. M. Ellis*, Deputy Conservator of Forests, the following changes and promotions are made in the Bengal-Assam list of officers in the Forest Department :—

Mr. A. J. Mein, Deputy Conservator of Forests, 4th grade, Assam, and officiating in the 3rd grade, to be Deputy Conservator of Forests, 3rd grade, with effect from the 24th April, 1883.

Mr. F. B. Manson, Assistant Conservator of Forests, 1st grade, Bengal, and Officiating Deputy Conservator, 4th grade, to be Deputy Conservator of Forests, 4th grade, with effect from the 24th April, 1883.

Mr. R. H. M. Ellis, Deputy Conservator of Forests, 3rd grade, Bengal, to be Deputy Conservator of Forests, 2nd grade, with effect from the 23rd May, 1883.

Mr. A. R. Grant, Deputy Conservator of Forests, 4th grade, Bengal, to officiate in the 3rd grade of Deputy Conservators, with effect from the 23rd May, 1883.

Mr. W. E. D'Arcy, Assistant Conservator of Forests, 1st grade, Punjab (transferred temporarily to Bengal), to officiate in the 4th grade of Deputy Conservators, with effect from the 1st September, 1883.

3.—NORTH-WEST PROVINCES AND OUDH GAZETTE—

No. 990.—*The 7th December, 1883.—Mr. A. G. Hobart-Hampden*, Assistant Conservator of Forests, from the School to the Oudh Circle, as a temporary arrangement.

No. 1027.—*The 28th December, 1883.*—With effect from the 1st October, 1883, *vice Mr. W. R. J. Brereton*, promoted :—

Mr. C. Bagshawe, Deputy Conservator, 3rd grade, to be Deputy Conservator, 2nd grade.

Mr. E. McA. Moir, Deputy Conservator, 4th grade, to be Deputy Conservator, 3rd grade.

Mr. A. Smythies, B.A., Assistant Conservator, 1st grade, to be Deputy Conservator, 4th grade, and to rank next below *Mr. E. P. Dansey* in that grade.

4.—PUNJAB GAZETTE—

No. 514.—*The 29th November, 1883.—Leave.*—In supersession of Notification No. 492, dated 21st November, 1883, it is hereby notified that the late *Bábu Kirpa Rám*, Probationer, Beas Division, was granted privilege leave of absence for one month and 4 days, with effect from the 1st October, 1883.

No. 517.—*The 30th November, 1883.—Mr. E. S. Carr*, Assistant Conservator of Forests, returned to duty on the afternoon of the 12th November, 1883, from the 3 months' examination leave of absence granted to him in *Punjab Government Gazette* Notification No. 444, dated 17th October, 1883.

The untaken portion of the leave is hereby cancelled.

No. 520.—*Mr. J. H. Lace*, Assistant Conservator of Forests, returned to duty on the afternoon of the 12th November, 1883, from the 3 months' examination leave of absence granted to him in *Punjab Government Gazette* Notification No. 441, dated 17th October, 1883.

The untaken portion of the leave is hereby cancelled.

5.—CENTRAL PROVINCES GAZETTE—

No. 5562.—Consequent on the return from special duty of *Mr. R. H. C. Whittall*, Deputy Conservator of Forests, the following changes in acting appointments are made with effect from the forenoon of the 18th November, 1883 :—

Messrs. L. A. W. Rind and *W. King*, Officiating Deputy Conservators of Forests, 3rd and 4th grade, will revert to their respective substantive appointments of Deputy Conservator, 4th grade, and Assistant Conservator, 1st grade.

Mr. R. H. C. Whittall, Deputy Conservator of Forests attached to the Direction Division, is transferred to the Chanda Forest Division, on special duty.

6.—BRITISH BURMA GAZETTE—

No. 71.—*The 3rd December, 1883.*—With effect from the 16th November, 1883, consequent on the return from privilege leave of *Mr. T. H. Aplin*, *Mr. H. B. Ward*, Assistant Conservator, 1st grade, Officiating Deputy Conservator, 4th grade, reverts to his substantive rank.

No. 72.—*The 11th December, 1883.—Mr. T. H. Aplin*, Assistant Conservator of Forests, reported his return from the privilege leave granted to him in this Department Notification No. 50, dated the 11th August, on the 16th November, 1883, before noon.

7.—MADRAS GAZETTE—

No. 196.—*The 19th November, 1883.—Mr. C. E. Brasier*, Assistant Conservator of Forests, 3rd grade, is transferred from the South Arcot to the Chingleput District to do duty under the orders of the Collector.

No. 212.—*The 14th December, 1883.—Mr. J. H. B. Brougham*, Assistant Conservator of Forests, 2nd grade, Anantapur District, is promoted to the 1st grade of Assistant Conservator, with effect from the 22nd September, 1883.

8.—BOMBAY GAZETTE—

No. 9126.—*Mr. H. Murray*, Assistant Conservator of Forests, Kánara (N. D.), passed on the 8th October last the examination prescribed in Rule 6 of the rules published in Government Notification No. 2878, dated 4th June, 1880, for the examination of Forest Officers.

No. 9127.—*Mr. F. Gleadow*, District Forest Officer, Jerruck Circle, Sind, passed on the 3rd October, 1883, the examination prescribed in Rule 6 of the rules published in Government Notification No. 2878, dated 4th June, 1880, for the examination of Forest Officers.

The 5th December, 1883.—Mr. W. R. Gaunde, Sub-Assistant Conservator of Forests, and *Mr. G. A. Hight*, Assistant Conservator of Forests, respectively delivered over and received charge of the District Forest Office, Kaládgi, on the 21st November, 1883, before office hours.